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ORIGINAL MEMOIRS.

THE VALUE OF DIRECT GASTRODUODENOSCOPY IN AFFECTIONS OF THE STOMACH AND THE DUODENUM.*

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EVEN with a thorough application of all the modern methods for examining the stomach as regards its chemical function and its motility, and of the methods for examining the contents of the stomach and the fæces for blood, there yet remain a number of cases where the diagnosis of the nature of a stomach disease or the differential diagnosis between a disease in the stomach and a disease in the duodenum is indefinable. In order if possible to arrive at a diagnosis in such cases without operating, one has worked for many years to develop a method which will bring the affected part within range of one's vision. The oldest of these methods is the so-called diaphanoscopy: the illumination of the stomach and abdominal wall by means of a glow-lamp introduced into the stomach through the œsophagus. When the patient is placed in the dark, the illuminated stomach is seen shining through the abdominal wall, and a large tumor or infiltration should reveal itself as a shadow against the light. This method, the

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idea of which originated with the French doctor Milland in 1867, as a result of his experiments on cadavers, was first attempted by Einhorn in 1889, and was employed in his clinic but has never had any great significance, for reasons which are easily understood. First, it shows only those gross abnormalities which can easily be diagnosed in other ways, and, second, only the very small part of the stomach which is not covered by the liver and chest wall can be seen. One has formed great expectations as to the efforts to construct a gastroscope on the same lines as the cystoscope for introduction through the œsophagus. Since 1881 Mikulicz and his pupils have worked energetically to solve this problem, and have indeed succeeded in constructing instruments whereby one can observe through a long tube a portion of the mucous membrane lighted by an electric lamp, but they have never succeeded in making these really practicable, partly because it is very difficult to insert this large instrument, as great practice on the part of the doctor and gradual habituation on the part of the patient are required, notwithstanding the use of very strong solutions of cocaine, and partly because the field of vision is too small and a survey in all directions is unattainable. Where the diagnosis is uncertain and medical treatment ineffective, we must resort to explorative laparotomy. As a rule, the inspection and palpation of the exposed stomach give us at once the diagnosis, so far as this is needful to define our therapeutic encroachment; but it cannot be denied that a no small number of cases remain, where this examination leaves us just as much in doubt as we were before: cases where we do not know whether an ulcer is present or not; others where we know that there must be an ulcer because of symptoms of hæmatemesis and melena, though we can neither feel nor see it; and others again, where indurations in the serosa or adhesions cause us to suspect the presence of an ulcer, though this might be due to other causes; and cases where we find an infiltration of the wall, but do not know whether this is a tumor or an inflammation infiltration. We understand how important, how absolutely necessary indeed, it is to have all possible information, in order to avoid

a fatal mistake in the treatment and in the choice of operation: whether a safe encroachment like gastropexy is sufficient, or whether a gastro-enterostomy, or possibly a resection of the stomach, is called for. A mistake in the choice of operative methods, founded on a doubtful diagnosis, is responsible for the evil results of many operations.

In order to avoid these mistakes, I have devised a method of examination, which in most cases has proved capable not only of clearing one's doubts, but which is moreover so simple and easy in its technic, that every surgeon can easily avail himself of it. I have called this method direct duodeno-gastroscopy and diaphanoscopy. My gastroscope is an instrument constructed like Nitze's cystoscope, though much larger, as it corresponds with Charriere's Nos. 39, 40, while the cystoscope corresponds with No. 21. Thus we obtain a far stronger source of illumination, and, what is of more importance, an enlarged field of vision. On the front of the tube runs a flat canal, which terminates at the fenestrum with a transverse fissure and opens upward into a projecting, tap-provided, small, bent tube, which is connected with an insufflator by a rubber drain. The entire apparatus is sterilized in formalin vapor, and held in readiness at the operation. If the diagnosis is doubtful, I make a small incision midway in the stomach, 2 cm. above the great curvature, and just large enough to permit the instrument to pass. In this way it is not necessary to make a tobacco-pouch suture to close the stomach wall tightly. As soon as the instrument is inserted, an assistant begins to inflate the stomach with air—by compressing the inflator—until all creases are effaced. The lamp is lighted and the large sterilized blind lowered, so that the room is in darkness. One sees the stomach shining like a large electric lamp, and one sees all anatomical details revealed in its wall with wonderful accuracy. With a normal stomach one sees the larger vessels of the greater and lesser curvatures straining toward each other with continuously dichotomous ramifications in the clear, somewhat rose-colored stomach wall, but one does not see them meet. The course of the muscle fibres in the various layers is seen

with the greatest distinctness, while the crypts evince themselves as small, whitish dots. A disease which is at once revealed by diaphanoscopy is gastritis in its various stages; because the stomach wall is then diffusely red, from strong rose to deep, bluish red; and while with the normal stomach one only sees the larger vessels aiming for the centre, here we see them connected by a more or less profuse plexus.

When there is no ulceration or gastritis, tumors are depicted as dark, diffuse shadows on the otherwise clear stomach wall. This was well illustrated in a case in which there was a tumor which had not betrayed itself clinically by any other symptom than *achylia*. At the operation, which was undertaken for a small hernia lineæ albæ, a flat infiltration of the anterior stomach wall was discovered, the nature of which could not be decided until diaphanoscopy and gastroscopy proved it to be a flat non-ulcerating tumor. Immediate resection of the stomach was performed, and the patient recovered. The tumor was an adenocarcinoma.

In strong contrast with this is the picture of the deep, chronic ulcers, which are distinguished by the centrally decayed and cicatrized part showing itself as a porcelain-like, whitish spot with a paucity of vessels, contrasting sharply with the surrounding red, hyperæmic part. If, on the other hand, small superficial ulcers of the mucous membrane are concerned, these are not revealed by diaphanoscopy, but are first discovered by surveying the mucous membrane through the gastroscope. Only when they are hemorrhagic, bleeding, or covered with coagula, does one see them depicted as dark spots on the wall, and when such a sore bleeds, one sees the stream of blood as a dark stripe pursue its way toward the greater curvature.

In order to inspect the hinder illuminated surface of the stomach thoroughly, the omentum and colon transversum must be raised. When one has illuminated the stomach, the gastroscope is led through the pylorus into the duodenum. Should there be the smallest difficulty in passing the gastroscope through the pylorus, one knows that there is a contraction of this. The wall of the duodenum, which is far

thinner than that of the stomach, can be illuminated more strongly and more satisfactorily, and a tumor or ulcer can be easily discerned.

It is seen what a surprising amount of information we can obtain from this illumination of the stomach. Often we obtain the complete diagnosis: gastritis, ulcer, or tumor. In most cases it is a valuable guide to the subsequent gastroscopy, because one immediately turns one's attention to that feature which the illumination shows to be abnormal. And, if one is then in doubt as to whether a shadow is due to an ulcer, a tumor, or an extravasation of blood, a direct observation through the gastroscope will provide a complete elucidation. The view obtained through the gastroscope is far better, sharper, and more certain than that given to the bare eye by an examination of the opened stomach, not only because the view is considerably enlarged and the illumination greatly intensified, but also because, when the stomach is inflated, all the folds, between which a small abnormality is so easily concealed, are smoothed out and made freely accessible to the investigator. With this gastroscope, therefore, one can make a systematic inspection of the entire mucous membrane of the stomach and of the top portion of the duodenum in the course of a few moments. The normal mucous membrane of the stomach shows itself in the gastroscope as a smooth, rose-colored surface, which merges at the cardia and pylorus into radially placed folds, which tend funnel-shaped toward the circular opening. Any abnormality in these two openings is shown in a very characteristic manner. If the pylorus is annularly infiltrated or contracted, one sees a stiff, yawning circle, through which one often obtains a glimpse of the duodenum; if only half of the pylorus circle is infiltrated, this becomes crescent-shaped because the soft mucous membrane on the sound part caves in to the rigid half. Ulcerous formations in the pylorus itself are easily detected, but the folds of the mucous membrane round the pylorus require more exact attention. In those cases where the cardia was abnormal, the gastroscope showed an extraordinarily satisfactory and dis-

tinct view of the tap-shaped, ventricle-prominent cancer of the cardia, and of its ulcerating attacks on the neighboring portions of the mucous membrane of the stomach.

With cases of ulcer and cancer, gastroscopy is of value when the main features of the diagnosis are assured, because it defines precisely the limits of the mucous membrane affections. It is of even more importance because it so often clears up doubtful points which the diaphanoscopy has left unsolved. In this way the gastroscopic picture has in many instances shown ragged, tumor substances in the mucous membrane, which left no doubt as to the malignant nature of the infiltration, when we imagined that a simple ulcus tumor was present. What seems, however, to be of the greatest importance, is that in a series of cases gastroscopy has proved the presence of ulcers which could not have been substantiated in any other way. This is particularly applicable to the duodenal ulcers and to the small, bleeding ulcers in the mucous membrane of the stomach.

Great appreciation and much gratitude are due Moynihan and Mayo for their work on ulcus duodeni, but just as certain as it is that these surgeons are correct in stating that ulcus duodeni occurs far more frequently than was formerly suspected, just so certain is it that the frequency with which they substantiate this disease does not accord with the facts. The explanation is, that Moynihan overshoots the mark in thinking that he can diagnose solely from the pains and from the seat and character of these.

On the one hand my experience comprises a series of cases where the patient, who presented Moynihan's typical complex of symptoms in such a way that no one doubted that it was a question of ulcus duodeni, proved with gastroscopy to be suffering from ulcus ventriculi or gastroptosis, while the duodenum was found to be completely normal.

On the other hand the gastroscope has in 12 cases demonstrated an ulcer in the duodenum, the presence of which was not to be suspected from the symptoms and could not possibly have been substantiated without the aid of the gastroscope.

I must very particularly discourage the diagnosing of ulcus from the fact that one finds at the inspection inspissation or whitish spots or strings adhering to the serosa, as these are generally due to external abuses: foldings and bends, and the distention of the peritoneal duplicature. It is especially with patients who are not afflicted with ptosis, where the duodenum lies deeply fixed and very difficult of access for purposes of palpation and inspection, that my direct duodenoscopy and diaphanoscopy are of great importance as regards the diagnosis.

This method is of even greater importance, perhaps, in cases of profuse, perilous hemorrhages from small ulcerations of the mucous membrane (exulceratio mucosæ simplex) which have been thoroughly described by Dieulafoi. These cases are, indeed, relatively rare, but they involve on the other hand an enormous danger to life, in face of which surgeons have hitherto stood helpless. This is a consequence of the fact that such ulcers are so small that, even on the dissecting table, one may not succeed in showing the little ulcer which has occasioned the fatal hemorrhage. One can understand, therefore, how much more hopeless it is to search on the operating table for such a tiny ulcer, and all the more so because the question concerns patients who are already in a state of collapse and extremely weak from excessive loss of blood.

But neither with these hemorrhages need we any longer remain helpless, since we have had the direct diaphanogastroscopy. Even in my first report on this method of examination, I predicted that it would probably bring about a revolution in the treatment of perilous hemorrhages from small ulcerations of the mucous membrane, because the demonstrating of such by illuminating the stomach would now be an easy and safe task. The bleeding spot would betray its presence as a dark point, interrupting the course of an artery, and from this a dark stripe down toward the great curvature would indicate the current of the blood. Such I have seen with an accidentally arisen hemorrhage. I imagined that one *might stop the bleeding surrounding the bleeding point with a purse-string suture*

direct from the outside during the illumination, an operation very easy to perform in a few moments.

My prediction was verified more rapidly than I had dared to hope, because only a few days after I had read my original paper before the medical society a woman suffering from an acute, profuse hemorrhage from the stomach was admitted to the ward of the senior physician, Dr. Vermehren, at Frederiksberg Hospital; and as the hemorrhage could not be stopped by severe internal treatment, and as the condition of the patient was becoming perilous, Dr. Vermehren transferred the patient to the head surgeon, Dr. Kraft, who then immediately operated on the patient. As soon as the gastroscope was introduced and the stomach illuminated, Dr. Kraft noticed a dark spot on the anterior wall of the stomach, and an artery running straight up to this spot, when it was interrupted abruptly. Through the gastroscope he verified the result of the diaphanoscopy, and demonstrated a small exulceration of the mucous membrane exactly on this spot. He then slit the stomach wall from the gastroscopy wound up to this ulcer, and inserted the ligature from the inside, after which the incision was closed. The patient recovered. Beside this case, five similar operations have resulted successfully by the co-operation of these two eminent physicians. On each occasion Dr. Kraft has succeeded, by means of gastrodiaphanoscopy, in quickly and surely demonstrating the small bleeding ulcer, and in these five cases he employed the far quicker and more simple mode of procedure which I have just mentioned, to make straight for the bleeding spot during the illumination, and surround it from the outside with a silk thread going through all the layers. On the outside of this a serosa suture was made for safety's sake. Only one of these patients died, but this was due to a sad accident during the gastroscopy, by reason of a failure in the town current supplied to the electric apparatus employed, which led to an extensive burn of the stomach—an accident which can never occur if one employs an accumulator as a source of light, which one naturally ought always to do after this experience. If this accident had not occurred, Dr. Kraft

would probably have the unique result of a percentage of 100 recoveries with this series of extremely serious cases. But even the five recoveries speak highly in favor of the method.

I therefore venture to assert that we have obtained in the direct gastroduodenoscopy described a method which, in those difficult cases where all other diagnostic expedients are insufficient, enables us to give the exact diagnosis in cases of disease in the stomach and the duodenum. It is of special importance in three directions:

1. In the numerous cases where the symptoms speak in favor of ulcus, but where inspection and palpation of the stomach show nothing of the sort. Here gastroduodenoscopy removes all doubt, and sometimes shows us that the supposed ulcer does not exist, whereby the patient is spared a senseless and injurious encroachment; and sometimes it proves the presence of the ulcer, its seat, and its nature.

2. For the differential diagnosis between ulcers in the stomach and the duodenum.

3. By rendering possible a direct attack upon the ulcer, where one had formerly to content oneself with gastro-enterostomy because the seat of the ulcer was unknown. This is of exceptional importance with ulcers, the hemorrhages from which constitute a menace to life, whether they be permanently oozing, small bleedings, or violent, acute hemorrhages. Nor, naturally, is this method infallible; as with it also one may sometimes overlook a small ulcer which has concealed itself in the folds of the mucous membrane, and may sometimes interpret a depression as being the edge of an ulcer or something similar, but this is of rare occurrence.

I do not hesitate, therefore, to introduce and recommend this method to American surgeons, confident that in their hands it will be bettered and will produce even better results than it has done in mine.

THE CONSERVATIVE TREATMENT OF GIANT-CELL SARCOMA, WITH THE STUDY OF BONE TRANSPLANTATION.*

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THE ultimate results of the cases of periosteal and medullary giant-cell sarcoma which I have observed personally, and similar records from the literature which I have been able to collect up to the present writing, confirm the conclusion reached many years ago—that conservative treatment is justifiable for this disease.

It seems to me that our accumulated experience is sufficient to-day to allow any surgeon who can make the diagnosis to follow conservative lines. It should not require courage—the procedure is no longer experimental. Nevertheless, correspondence with my colleagues in this country forces the statement that many surgeons hesitate to treat giant-cell sarcoma of bone by any method except amputation. Others prefer a wide resection to curetting.

I became interested in sarcoma of bone when I first came to Baltimore in 1892, and I remember distinctly that Dr. Halsted frequently referred to Koenig's case or two of giant-cell sarcoma which were curetted with good results. Along with other problems in surgical pathology, I began to investigate critically all the material of bone sarcoma in the Johns Hopkins Hospital.

From correspondence with the patients it at once became evident that there was something different in the so-called giant-cell sarcoma. Practically all of these patients answered the letters. Most of the other cases of bone sarcoma had died of the disease.

In 1899, when I first began to write critical reviews for

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Progressive Medicine, I discussed in the first number (December, 1899, p. 238) the question of resection instead of amputation for malignant sarcoma of the long bones. I could not find the reference to Koenig.[1] Mikulicz (*Archiv. f. klin. Chir.,* 1895, Bd. 1, p. 661) apparently was one of the first to practise and publish on this subject. Wiesinger followed with a short report (*Deutsche med. Wochenschr.,* Oct. 20, 1898). Then there were reports of conservative treatment by Morton (*British Med. Jour.,* July 23, 1898), Karewski (*Berliner klin. Wochenschr.,* Aug. 22, 1898) and Hinds (*British Med. Jour.,* February 26, 1898). Since this date (1899), now a period of almost thirteen years, I have carefully reviewed practically all the important contributions to the literature in the December numbers of *Progressive Medicine,* at the same time recording my own accumulating experience.

In April, 1901, I was given the opportunity in a meeting of the Philadelphia Academy of Surgery to discuss a very scholarly address by John A. Wyeth, of New York (ANNALS OF SURGERY, 1901, xxxiv, 594), on amputation at the hip-joint for sarcoma and the tendency to recurrence. Apparently I was the only one who took the view that conservative treatment was justifiable, even in the giant-cell sarcoma. I gave reference there to the literature, calling attention, first, to Koenig's statement in his text-book many years ago; to the cases which I had studied in Dr. Halsted's clinic from 1889 to 1901, a period, then, of twelve years. I got the impression that I told the truth to the wrong audience.

In December, 1902, I was given the opportunity to test the strength of my own convictions. A patient, aged twenty-nine, came under my care with a medullary tumor in the upper end of the tibia. I had seen a few X-rays of giant-cell sarcoma at that time. These pictures I reproduce here again (Fig. 1, anteroposterior view, and Fig. 2, lateral view). I

[1] The early literature on the conservative treatment of sarcoma of the long bones will be found collected and reviewed by Von Haberer, Zeitschr. f. Heilkunde, 1906, vol. new series vii, Heft 1, who also reports the experience of Von Eiselsberg's Clinic in Vienna.

was not certain of the diagnosis before operation, but from the long history of symptoms—at least nine years—and the demonstration of the preservation of a distinct bone capsule in the X-ray, I concluded that the medullary tumor was probably a giant-cell sarcoma. This case was reported in detail in 1903 (*Johns Hopkins Hospital Bull.*, vol. xiv, p. 138, May, 1903) and has been referred to frequently since that date in the December numbers of *Progressive Medicine*.

At that time I told the patient that in the cases which I had studied in the Surgical Pathological Laboratory and among those mentioned in the literature, I had been unable to demonstrate a single authentic death from a pure medullary or periosteal giant-cell sarcoma. I told him that cases had been cured by curetting, that a number of cases curetted had recurred, and been subsequently cured by a second curetting; others by a later resection in continuity, and still others by a later amputation; but that as far as I could ascertain by a most diligent search, no harm had been done by an unsuccessful curetting. In his case a successful curetting would mean a cure with a limb practically unimpaired as to function, while resection would result in much shortening. At that time our technic of bone transplantation had not been developed.

This patient chose curetting. The tumor was easily recognized at the exploratory incision; the curetting was performed with an Esmarch on the thigh; after curetting, the cavity was thoroughly disinfected with carbolic acid, and the wound packed tightly with gauze. The wound was long in healing. To-day we would have transplanted into the cavity a piece of bone to hasten healing. This patient is well (July, 1912), with a serviceable limb almost ten years since operation.

In my paper before this Association in 1910 (*Transactions of the American Surgical Association*, 1910, p. 39, and ANNALS OF SURGERY, August, 1910, vol. lii, p. 145), I reported the cases of giant-cell sarcoma which had remained well after curetting. I will add to that list in this, the second, communication.

The points I wish to emphasize first, therefore, are, that

the statement made to this patient in 1902 holds equally good to-day; that it can be supported by more evidence, and that each case is stronger from the fact that the period of freedom from recurrence since the operation has increased.

TRAUMA AND BONE SARCOMA.

Many investigators, both clinical and experimental, have been interested the last few years in the possibility of a precancerous lesion. By this is meant a visible, palpable lesion of a benign nature, either a benign tumor or an inflammatory focus. In this benign lesion, experience teaches, there is a possibility of malignant degeneration. Apparently all agree that cancer usually begins in such a lesion and rarely, if ever, in the normal epidermis or mucous membrane. In most instances the benign lesion is recognizable and always easily removable. Why not, therefore, be on the lookout for such lesions? If these were removed, might we not expect a great decrease in the number of cancers of the skin and mucous membrane?

In investigating sarcoma of bone, it is much more difficult to demonstrate a precancerous lesion than in cancer of the skin and mucous membrane, but one fact stands out prominently, and that is—trauma.

I have been impressed in this investigation with the great importance of looking upon contusions of bones and joints with a more critical eye than has been done in the past, and I have come to the conclusion that an X-ray examination after the injury, and later at intervals if the symptoms do not disappear, is the only means by which we can recognize the more malignant types of bone sarcoma at an earlier period.

In 1910 there were 154 examples of bone lesions in the Surgical Pathological Laboratory of the Johns Hopkins Hospital (Recent Progress in the Surgical Treatment of Malignant Growths, *Jour. of Amer. Med. Assoc.*, Oct. 29, 1910, vol. lv, p. 1527).

Among these 60 were distinctly benign tumors. Of these again 34 may be looked upon as exostoses, 20 benign bone

cysts or ostitis fibrosa, and 6 rare benign tumors: myxoma, chondroma, osteoma, and fibroma. There is apparently little relation between the trauma and the periosteal exostoses—most of these seem to be of congenital origin and are often multiple. A single or a repeated trauma may excite the growth in one of the tumors. The X-ray makes the diagnosis. The relation of trauma to the benign bone cyst and ostitis fibrosa is much more manifest. I am inclined to the view that the number of benign bone cysts shows increase in recent years due to the systematic X-ray studies after all injuries when there are clinical signs of fracture. Recent experience has shown that bone cysts may heal spontaneously, and undoubtedly in the past many cases present in the bones at the time of the fracture have healed and were overlooked, because no X-ray was taken.

In this group of benign bone lesions an earlier X-ray study would reveal the lesion when it is smaller, and thus allow treatment at a period in which a cure could be accomplished with less mutilation and a shorter period of disability.

The number of giant-cell sarcomas in my collection in 1910 was 22: three periosteal and 19 medullary. Since then I have observed four further cases of the medullary type. It is the medullary giant-cell sarcoma that I am considering in this paper. The clinical records of these 26 cases show that if a routine examination had been made with the X-ray in cases where the pain did not disappear quickly after a slight contusion, or when, without the history of a trauma, such an X-ray study had been made because of pain or limp, the disease would have been recognized at a much earlier period. Now, as a matter of fact, all of these 26 cases are living, and the same is true of the cases collected from the literature, but in many instances, perhaps the majority of cases, the tumor had reached a size which necessitated a much more radical operation than curetting. The earlier X-ray studies, therefore, will not increase the number of cures in giant-cell sarcoma, but will undoubtedly increase the number of cases in which the diseases can be removed without mutilation.

The remaining cases in my table are malignant. There are eight cases of the less malignant type, 50 of the most malignant forms of sarcoma, one multiple myeloma, and 13 cases of metastatic carcinoma. Among the 50 examples of sarcoma of the most malignant type, in 18 the disease was inoperable; in 34 high amputation was performed without a single cure. Among the eight examples of less malignant sarcoma there were five permanent cures—three periosteal osteosarcomas, two out of four myxochondrosarcomas, and one fibrosarcoma.

The only hope of increasing the number of cures among the less malignant sarcomas and of accomplishing a single cure among the most malignant sarcomas depends upon the diagnostic employment of the X-rays after simple injuries when the symptoms do not subside rapidly and for cases complaining of localized pain in a bone or joint. My investigation teaches me that the employment of the X-rays as an aid in the early diagnosis of lesions of bones and joints cannot be urged too strongly.

Pathol. No. 12379. Joint Fracture of Articular Surface of Tibia.

Fig. 3 is the X-ray of a knee-joint after a slight contusion. It shows a fracture of the articular surface of the tibia. The separated piece of bone was easily replaced through an arthrotomy about six days after the injury, and the patient was able to work after four weeks. There could be no dispute as to the different result if this X-ray had been omitted and the sprained knee treated by ordinary methods.

X-rays of the early stage of the more malignant periosteal and medullary sarcomas of bone are conspicuous by their absence in the literature, and I have only one in my personal collection.

Pathol. No. 12050. Early Picture of Periosteal Spindle- and Round-cell Sarcoma.

Fig. 5 shows an anteroposterior view of the knee-joint. The outer condyle of the femur is abnormal; there is slight erosion of

bone, breaking the line of the outer table, and some new bone formation. I have compared this with traumatic ossifying periostitis, luetic periostitis, the bone changes in the different types of arthritis, and this investigation has clearly illustrated that the shadow in this case was sufficiently different to arouse the suspicion that it was the beginning of a periosteal sarcoma and to justify exploration. Fig. 6, the lateral view, shows toward the popliteal space a fairly large defect in the outer condyle. These X-rays were taken in June, 1911, because the patient had pain in the knee with limp, but no swelling. He refused operation at that time. I did not see the patient until September 29, three months later. In this time a huge tumor had formed in the popliteal space, had ulcerated, and become infected. Amputation was performed, but the patient died of infection and the autopsy revealed metastasis. Here, therefore, was the opportunity for an earlier intervention, but for some reason the method of presenting the operation to the patient was not successful.

Pathol. No. 12845. Infectious Arthritis of Left Acromioclavicular Joint.

The patient, a male aged forty-nine, suffered in February, 1912, from a purulent rhinitis; about the tenth day of this infection pain in the left shoulder was experienced and was most marked on forced motion; there was pain in no other joints. The discharge from the nose disappeared, but the localized pain persisted; swelling was observed three weeks ago, about three months after the onset of pain. He has received local and general treatment for rheumatism, but no effort has been made for exact diagnosis. At my examination, May 25, I found a little soft swelling over the joint, suggesting thickening of the capsule and some fluid; local tenderness and pain on forced motion. The X-ray (Fig. 4) shows light bone destruction and some bone formation. It suggests more osteoarthritis than periosteal sarcoma. The Wassermann reaction was negative, also the tuberculin test. I advised exploration, because it was my opinion that periosteal sarcoma in its earliest stages could not be excluded. If this disease were present the chances for a cure were best now; in addition, the exploration would probably hasten the cure of an inflammatory process. The operation was performed May 27, 1912, under novocaine: the capsule of the joint was thickened, the joint contained clear fluid; there was some bone destruction

and a little periosteal bone formation; some of this tissue was removed, the wound disinfected with carbolic acid and alcohol, and closed. The frozen sections show an inflammatory process. The wound healed *per primam*, and on July 15 the local pain and tenderness had disappeared.

In a second paper I propose to publish with illustrations a discussion of the differential diagnosis of the different types of periostitis, osteomyelitis, arthritis, and ossifying myositis from sarcoma. At the present time, however, I have a large collection of only the benign and inflammatory lesions, and only this one of sarcoma in its early stage.

THE TREATMENT OF SARCOMA OF BONE WITH COLEY'S SERUM.

It is my opinion that we owe Dr. Wm. B. Coley, of New York, a debt of gratitude for his persistent efforts to treat sarcoma with the toxins of streptococcus and *Bacillus prodigiosus*. I agree with him that this serum should be employed in all inoperable cases; that it also should be used before and after operation in operable cases when the sarcoma is of a type which experience has shown to be very malignant, and in which few, if any, cures have been accomplished.

I cannot agree with Dr. Coley, however, in his advocacy of this treatment for giant-cell sarcoma, and I do not think he is justified in including cases of giant-cell sarcoma among his cured cases as additional evidence of the efficacy of his serum.

I have now 26 cases of giant-cell sarcoma which I have studied personally. Every one of these patients is well. In not a single case was there any treatment other than removal of the disease by the curette, by excision, or by amputation. The same is true of a large number of cases recorded in the literature. It seems to me that there is no more reason for giving a patient with giant-cell sarcoma, Coley's serum, X-ray, or radium treatment, than to employ them for lipoma, exostosis, or any other type of benign tumor. I cannot find in Dr. Coley's reports any evidence to justify the conclusion that the treatment of the patient with toxins before and after

operation will allow the surgeon to perform a less radical operation when the disease is too extensive for curetting. If Dr. Coley could furnish this evidence, it would at once justify its employment in late cases.

I have a letter from Dr. Coley dated March 6, 1912, concerning a case which I shall report in this paper. The tumor involved the lower end of the ulna (Figs. 27, 28, and 29). Dr. Coley agreed with me that local resection was justifiable, but he earnestly recommended the employment of toxins before and after operation.

The objection to the toxins in medullary giant-cell sarcomas is the discomfort which follows each injection, and, in my opinion, the lack as stated before of any evidence that it is necessary.

MEDULLARY GIANT-CELL SARCOMAS WHICH HAVE REMAINED WELL AFTER ONE CURETTING.

CASE I (Pathol. No. 4520, Figs. 1 and 2, Bloodgood).—Curetting Dec. 4, 1902. Well May, 1912, nine years and five months. Large tumor in upper end of tibia. Symptoms nine years. In this case amputation had been advised.

CASE II (Pathol. No. 6893, G. G. Davis, of Philadelphia).—Operation December, 1904. May, 1912, well, seven years and five months. Tumor lower end of ulna.

These two cases were previously reported in the *Transactions of the American Surgical Association* for 1910 and the ANNALS OF SURGERY for August, 1910.

Since this report two further cases have come under my observation:

CASE III (Pathol. No. 12926, operator Dr. John W. Chambers, of Baltimore).—Medullary giant-cell sarcoma of upper end of right fibula. The patient is a white female aged twenty-three; 17 months before operation she received an injury in this area while roller-skating. The pain has never entirely disappeared; swelling was observed six months after the injury and gradually increased; pain was experienced chiefly when walking. On examination there was a uniform expansion of the upper end of the

fibula; no fluctuation; the skin was tense over the swelling, and the superficial veins prominent. The X-ray (Figs. 7 and 8) suggests giant-cell sarcoma because of the very thin bone capsule. On May 11, 1911, Dr. Chambers first divided the fibula below the tumor preparatory to resection; then, after exploration of the tumor, decided to curette, which was done. The bone cavity was then disinfected with carbolic acid, followed by alcohol and packed with gauze. I have examined the sections from the tumor and agree with Dr. Chambers's diagnosis of giant-cell sarcoma. Fig. 9, an X-ray ten months after operation, shows the healed fracture of the fibula below the tumor and the bone cavity partly filled with new bone. This patient is apparently well one year after operation.

In this case the bone capsule was very thin, and if this patient remains free from recurrence, we will have an extreme test of curetting. In view of my own experience and that in the literature, and in view of the fact that resection of this portion of the fibula does not interfere with function of the limb, I should have resected in a case of this character.

Case IV (Pathol. No. 12207, operator Dr. A. R. Kimpton, of Boston).—The patient is a child five years of age. One year and four months before operation the child fell from a porch only about 12 inches high, striking on soft earth; in spite of this slight injury a fracture of the shaft of the tibia resulted; no X-rays were taken then. Following this there was more swelling than was to be expected after a simple fracture, and this continued without pain; it was tender, however. The X-ray (Fig. 10) was taken just before operation. It is unusual for either a cyst or a giant-cell tumor to be localized so far from the epiphysis. At the operation in November, 1911, Dr. Kimpton writes, he found the tumor had perforated the thin periosteum at one point. The tumor was soft, light yellow in color, with radiating bands of fibrous tissue; there were no cysts. The growth was removed by curetting, and some of the surrounding bone was chiselled; the cavity was disinfected with Harrington's solution. On account of bleeding the cavity had to be tightly packed with gauze. This gauze was removed on the fifth day and the wound closed. Figs. 11 and 12 show the result four months after operation: there is no appear-

ance of recurrence. The child is apparently well June, 1912, seven months since operation. Drs. Mallory and Nichols report on microscopical examination a giant-cell tumor with considerable fibrous tissue.

On further study this case may prove a border-line pathological condition between a bone cyst, ostitis fibrosa, and a giant-cell tumor. I am now investigating this question and trust to make a report later.

The following cases have been collected from the literature. They are all medullary giant-cell sarcomas which have remained well since curetting, and were all included in my previous publication.

O. KOCHER: Left tibia; patient well three years. Patient aged twenty-six; symptoms two years and three months.

KRAMER: Lower end of femur; patient well twelve years. Age sixteen, symptoms six months.

KRAMER: Upper end of humerus; patient well eight years. Age thirteen years, symptoms six months.

KAREWSKI: Inner head of tibia. Patient aged twenty-six, tumor six months. Well eighteen months (*Progressive Medicine*, Dec., 1899, plate iv, p. 242).

KAREWSKI: Shaft of femur; patient well four years. Age of patient and duration of tumor not stated.

HINDS: Lower third of femur; patient well sixteen years. Age thirty-four, symptoms fifteen months (see Fig. 33).

These five cases are reported as giant-cell sarcomas of the medullary type.

JENCKEL: Here the tumor was situated in the trochanter minor of the femur. The patient was twenty-two years of age, and the symptoms had been present four and one-half months. The tumor is described as having a distinct bony shell and bloody contents. There is no microscopic description of the wall. The gross description corresponds to that recorded by G. G. Davis in his case in which the tumor was situated in the lower end of the ulna. This patient of Jenckel remained well twelve and one-half years after curetting. The diagnosis rests between a giant-cell sarcoma and a bone cyst.

There are, therefore, at the present time, nine examples of medullary giant-cell sarcoma which have not recurred after curetting.

I have examined the tissues in four of these cases, and

FIG. 1.

Pathol. No. 4520. Bloodgood's case. Medullary giant-cell sarcoma of upper end of tibia. Age 29, symptoms 9 years. Well nine years after curetting. X-ray before operation, anteroposterior view.

FIG. 2.

Pathol. No. 4520. Same as Fig. 1. Lateral view.

FIG. 3.

Pathol. No. 12379. Bloodgood's case, St. Agnes Hospital. Fracture of articular surface of tibia. X-ray three days after injury (joint fracture). This bone was replaced by arthrotomy. Perfect result.

FIG. 4.

Pathol. No. 12845. Male, aged 49; pain acromioclavicular joint three and one-half months; swelling 2 months. X-ray shows bone destruction and bone formation at this joint. Diagnosis of joint inflammation confirmed at exploratory incision.

FIG. 5.

Pathol. No. 12050. X-ray taken by Dr. Cotton of Mercy Hospital. Anteroposterior view. Early picture of a periosteal spindle- and round-cell sarcoma of the outer condyle of the femur. At this time the patient complained of pain only. There was a slight limp, but no swelling.

FIG. 6.

Pathol. No. 12050. Lateral view of X-ray shown in Fig. 5.

FIG. 7.

Chambers's case. Medullary giant-cell sarcoma of upper end of fibula. X-ray before operation taken by Dr. Cotton. Anteroposterior view. Note the large size of the tumor, with preservation of the bone capsule. Female, age 23. Trauma $\frac{8}{12}$ months, pain and swelling 11 months.

FIG. 8.

Same case as Fig. 7. Lateral view before operation.

FIG. 9.

Chambers's case. X-ray 10 months after operation—curetting. Note the new bone formation filling the cavity occupied by the giant-cell sarcoma which was removed by the curette. This new bone comes from the bone capsule. The fibula below was fractured at the operation. Well, 13 months.

FIG. 10.

Pathol. No. 12207. Kimpton's case. Medullary giant-cell sarcoma of shaft of tibia in a baby. X-ray, lateral view before operation.

FIGS. 11 AND 12.

Pathol. No. 12207. Kimpton's case. X-rays four months after operation. Anteroposterior and lateral views. See Fig. 10 for X-ray before operation. X-rays taken by Drs. Dodd and George, of Boston.

FIG. 13.

Pathol. No. 10376. Chambers's case. The result many months after the second curetting of a giant-cell sarcoma shown in Fig. 34 of my previous communication.

FIG. 14.

Pathol. No. 8412. Bloodgood's case. X-ray after operation. To illustrate transplantation of piece of ulna into radial defect. X-ray retouched, as it was too faint for reproduction.

FIG. 15.

Pathol. No. 275. Dr. Halsted's case. Periosteal giant-cell sarcoma of lower end of ulna. Age 45, tumor one year. Resection of lower end of both bones with tumor. Photograph of result. No recurrence 15 years after operation.

FIG. 16.

Pathol. No. 6125. Dr. Halsted's case. X-ray before operation. Patient aged 22, tumor 20 months. Resection of lower end of both bones. Well seven years, function of hand impaired. X-ray by Dr. Baetjer.

FIG. 17.

Pathol. No. 10975. Bloodgood's case. Photograph of patient, age 26; pain three years, swelling one year.

FIG. 18.

Pathol. No. 10975. Bloodgood's case. X-ray by Dr. Ashbury before operation.

FIG. 19.

Pathol. No. 10975. Photograph of a section through the tumor shown in Figs. 17 and 18. Note that the disease has extended to the joint capsule, and the bone shell is very thin and absent in some places.

FIG. 20.

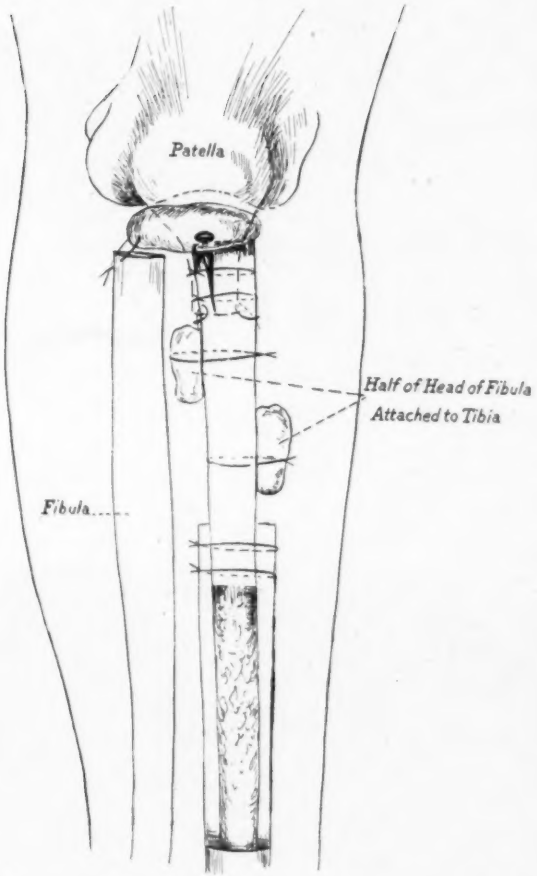


Diagram showing transplanted bones fixed in position with wire and screws.

FIG. 21.
a

Pathol. No. 10975. Bloodgood's case. X-ray one month after transplantation of bone.

FIG. 21.
b

Same as Fig. 21 *a*. Lateral view.

FIG. 22.
a

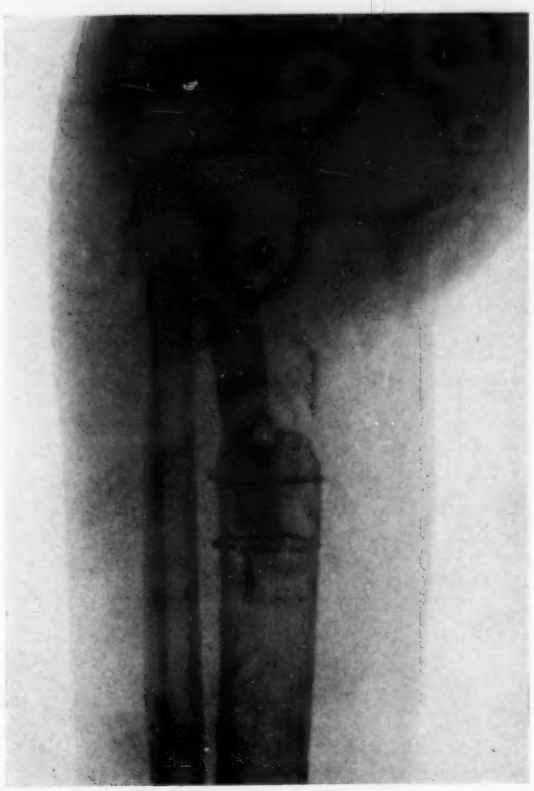


FIG. 22.
b

Same as Fig. 21. X-rays, eighteen months after operation. *a*, lateral view; *b*, anteroposterior view.

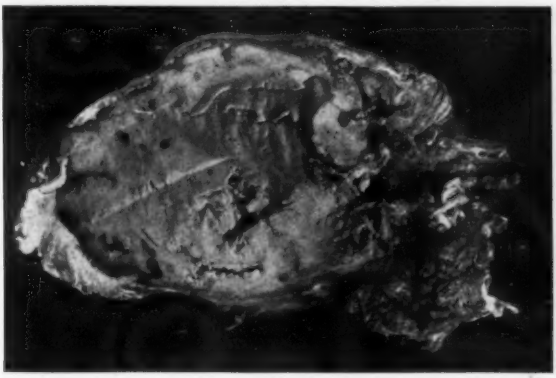
FIG. 23.

Pathol. No. 10975. Bloodgood's case. Photograph of the limb six weeks after operation (see Figs. 21 and 22). The limb one year and six months after operation has the same appearance.

FIG. 24.

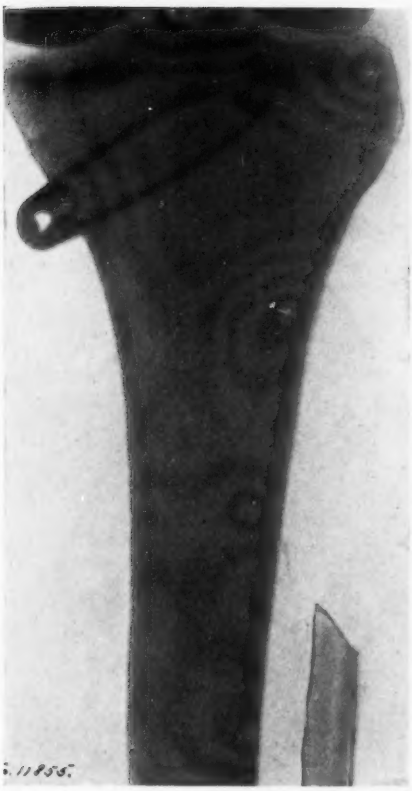
Pathol. No. 11855. Bloodgood's case. Medullary giant-cell sarcoma of upper end of fibula. X-ray before operation by Dr. Baetjer. White female, aged 21, trauma seven months; pain, swelling five months. Resection. Nine months well.

FIG. 25.



Pathol. No. 11855. Photograph of specimen excised. See Fig. 24 for X-ray.

FIG. 26.

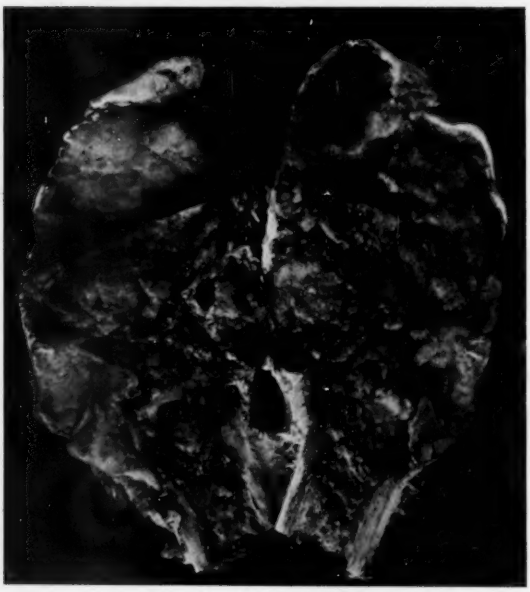


Pathol. No. 11855. Bloodgood's case. X-ray after operation of case shown in Fig. 25. There is absolutely no weakness in this leg, in spite of the defect in the upper third of the fibula. Compare with Chambers's case, Fig. 9.

FIG. 27.

Pathol. No. 12474. Bloodgood's case. Medullary giant-cell sarcoma lower end of ulna. Patient aged 48; trauma 8 months; pain since; swelling 2 weeks. Resection, bone transplantation. X-ray before operation.

FIG. 28.



Pathol. No. 12474. Photograph of the bisected tumor (by Mr. Schapiro), removed in case shown in Fig. 27. Note the thinness of the capsule, the red currant-jelly areas and the white areas. Giant-cells predominate in the red areas, ostitis fibrosa in the white areas.

FIG. 29.

Pathol. No. 12474. X-ray after operation in case shown in Figs. 27 and 28. Illustrates the transplanted piece of ulna. The patient has good function.

FIG. 30.

Pathol. No. 12927. Patient of Dr. Emil G. Beck. Giant-cell sarcoma of lower end of radius. Resection.

FIG. 31.

Pathol. No. 10929. Bloodgood's case. Benign bone cyst, recurrent twice after curetting. Third extensive curetting with transplantation of piece of tibia to fill the defect. This X-ray was taken after operation.

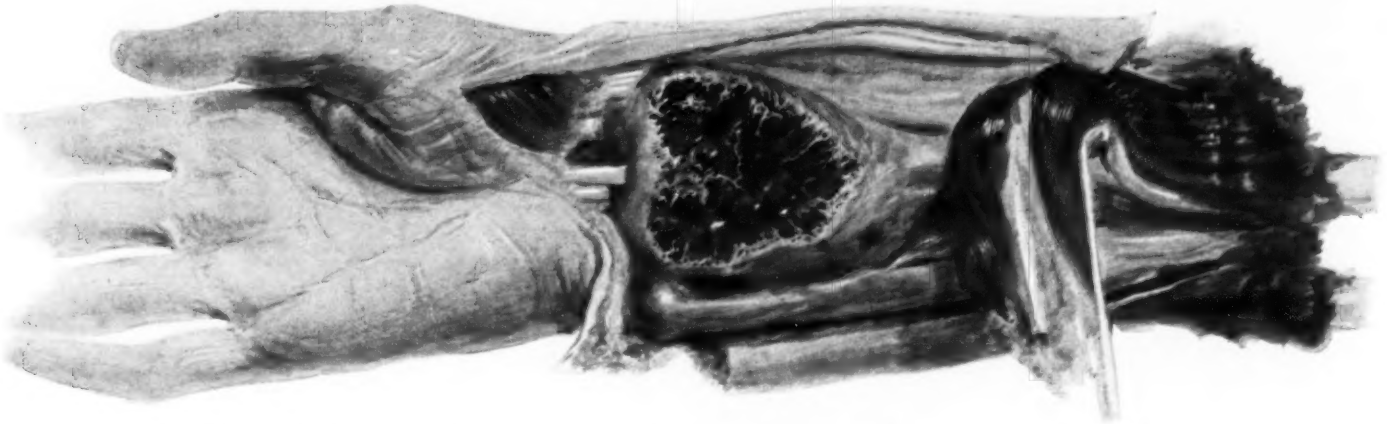
FIG. 32.

Same case as Fig. 31. X-ray of tibia six weeks after a piece had been excised for transplantation into the cavity of the humerus.

FIG. 33.

X-ray of the result of curetting of a giant-cell sarcoma involving the lower end of the femur more than eighteen years after operation. Taken July, 1912. Case of Dr. Frank Hinds, of England. First reported in the British Med. Jour., February 26, 1898. See page 220.

FIG. 34.



Pathol. No. 1815. Giant-cell sarcoma of lower end of radius. Dr. Halsted's case. White male, aged 45. Fracture (Colles') 2 years 4 months; apparent recovery. Three months later pain and swelling. Amputation of arm. Twelve years well (1912). X-ray and painting of specimen show that the tumor is distinctly within a bone capsule and could have been cured by curetting or excision. (Painting by Dr. Harvey Cushing.)

operated on one. In the five cases taken from the literature the pathological reports are sufficiently clear to allow a diagnosis of a giant-cell sarcoma. None of these cases received either the X-ray or the serum. In all of them, as far as I can ascertain, the cavity was disinfected with pure carbolic acid, followed by alcohol, as in my case, or by some other disinfectant, in addition to curetting. I have emphasized this point in technic in my previous communication. Prof. von Eiselsberg, in the discussion two years ago, also emphasized the importance of disinfecting the cavity after curetting.

MEDULLARY GIANT-CELL SARCOMAS WHICH HAVE RECURRED AFTER THE FIRST CURETTING, BUT HAVE REMAINED WELL AFTER THE SECOND.

CASE I (Pathol. No. 10376).—The tumor was situated in the lower end of the radius in a female aged twenty-five, with symptoms five months after trauma. The disease was curetted in April, 1908, by Dr. Chambers, of Baltimore; there was a recurrence with a second curetting a few months later. I am informed to-day (July 17, 1912) by Dr. Chambers that the patient is well and has a most useful arm. I have also just seen the recent X-rays of the result. This case has been previously reported. Fig. 13 shows the lower end of the radius after curetting. This X-ray of Chambers's case before operation should be compared with that of Beck (Fig. 30). The latter felt that resection was indicated.

MEDULLARY GIANT-CELL SARCOMAS WHICH RECURRED AFTER CURETTING, BUT HAVE REMAINED FREE FROM RECURRENCE AFTER A LOCAL RESECTION.

CASE I.—This case has been previously reported by me (Pathol. No. 9881). Operation March, 1909, by Dr. J. C. DaCosta, of Philadelphia: curetting of a tumor entirely confined to the inner condyle of the lower end of the femur. There was a recurrence, and in July, 1909, four months later, I was given the opportunity by Dr. DaCosta to resect the condyle. This patient is well (May, 1912) now almost three years. The illustrations will be found in my previous report in the ANNALS OF SURGERY, Figs. 32 and 33.

CASE II (Pathol. No. 8412).—This case has also been pre-

viously reported. (Fig. 35 in the ANNALS OF SURGERY.) The patient was twenty-nine years of age and had had a swelling of the lower end of the radius twenty months. The swelling had followed a trauma. There had been three operations before I saw the patient, four, twelve, and sixteen months ago. The first two were curettings, the third a resection of the lower end of the radius. In August, 1907, I resected the encapsulated recurrent tumor occupying the position of the lower end of the radius and transplanted the ulna into the defect (Fig. 14). This patient has remained well nearly five years since operation and has very good function.

Jens Schou (*Centralbl. f. Chir.*, 1911, xxxviii, 230) reports briefly what may have been a giant-cell sarcoma of the lower end of the ulna. His first attempt was curetting and X-ray treatment, but without result; he then resected the lower end of the ulna with the tumor and reports, almost three years after operation, no recurrence, good motion, and no deviation toward the ulnar side. If this is correct, it would apparently suggest that it is unnecessary to transplant bone into an ulnar defect after resection, as done by me in a case to be reported in this paper.

MEDULLARY GIANT-CELL SARCOMAS WHICH HAVE RECURRED AFTER CURETTING AND HAVE REMAINED WELL AFTER AMPUTATION.

CASE I.—Previously reported (see Fig. 31 in ANNALS OF SURGERY) (Pathol. No. 7440). Operation January 26, 1906, by William J. Taylor, of Philadelphia. There was a recurrence in a few months followed by amputation. The patient is well (May, 1912) more than six years since the amputation.

In two additional cases there was curetting for diagnostic purposes followed by amputation. In one of them (Pathol. No. 1815, Fig. 34), with the tumor in the lower end of the radius, the patient is well sixteen years after an amputation by Dr. Halsted at the Johns Hopkins Hospital. The second case was under the care of Dr. Jas. F. Mitchell, of Washington. The curetting for diagnostic purposes was performed by Dr.

J. B. Murphy, of Chicago, the amputation later by Dr. Mitchell. This patient is well four and one-half years after operation. I have seen the microscopic sections from this case (Pathol. No. 7861; see Fig. 38 of the previous report).

The evidence, therefore, demonstrates that no harm can come from an attempt to cure by the removal of the tumor with the curette. The technic of this has been described in my previous communication. The operation should be performed under an Esmarch, the wound disinfected after the curetting, and the cavity packed tightly with gauze before removing the Esmarch. There is always danger of hemorrhage. I have experienced this in curetting the large tumor from the upper end of the tibia. Taylor had the same experience in the lower end of the femur. Davis had no trouble with his small tumor at the lower end of the ulna of a child, nor had Kimpton with his tumor in the shaft of the tibia. The probability of severe hemorrhage undoubtedly depends upon the size and situation of the tumor.

My recent experience teaches me that we can hasten the healing of the cavity after curetting by transplanting into the cavity a piece of bone. I would recommend this, if the hemorrhage can be checked and the cavity is large enough to require it. I am inclined to the view that in Emil Beck's (Fig. 30) case it would have been possible to avoid resection by employing this method.

The new point, therefore, which I am presenting here, is that bone transplantation will in the future probably allow us to more frequently employ the curette in the treatment of a giant-cell sarcoma, and in some cases, where the bone shell is very thin, it will allow us to restore the continuity of the bone by a less difficult procedure than resection and bone transplantation. I am quite certain that in my case of giant-cell sarcoma of the upper end of the tibia, I could have removed the gauze after the tenth day and transplanted a piece of the opposite tibia into the defect. I have done this recently in a cavity of a large bone cyst with a perfect result (Figs. 31 and 32). In Davis's case of tumor of the lower end of the ulna

and in Chambers's case of the lower end of the radius, the cavity was not large enough to make transplantation necessary. It is quite possible that Dr. Chambers subconsciously restricted the extent of his first curetting, fearing injury to the continuity of the bone. But, with the knowledge of the possibilities of bone transplantation, a surgeon need not fear to go to the utmost limit with the curette. Perhaps in Kimpton's case, it would have been better to transplant bone if the child had been older or an adult, but apparently the re-formation of bone in his case is progressing rapidly. In DaCosta's case where I resected the inner condyle of the femur I would now add bone transplantation. Although the patient has good function, I think bone transplantation would have added to the strength of the joint. In the case in which I excised the recurrent tumor in the lower end of the radius and transplanted into the defect a piece of the ulna, I would to-day leave the ulna intact and transplant a piece of the tibia into the radial defect. This would promise equally good function without shortening.

In Wm. J. Taylor's case in the lower end of the femur, it is my opinion that he would have been justified in attempting a second curetting and filling the cavity with transplanted bone.

MEDULLARY GIANT-CELL SARCOMAS WHICH HAVE REMAINED WELL AFTER RESECTION IN CONTINUITY.

The first resection for giant-cell sarcoma in the Johns Hopkins Hospital was performed by Dr. Halsted in 1893. The tumor in this case was, however, a periosteal giant-cell sarcoma surrounding the lower end of the ulna. The patient was a colored woman aged forty-five; there had been pain localized in the lower end of the ulna one year, and then swelling. The tumor pulsated. In resecting the tumor Dr. Halsted removed the lower end of both radius and ulna and the first row of carpal bones. The tumor had in places invaded muscle. I found in one section giant-cells within a few millimetres of the border of the tissue removed with the knife. In this case the patient lived fifteen years after operation

without any signs of recurrence. After that I lost track of her. As shown in Fig. 15 there is a flail joint, but the patient worked for a number of years as a laundress, using this hand. This case, it seems to me, is good evidence of the benignity of a giant-cell sarcoma. Here we have a pulsating, infiltrating tumor, which has been removed with a very narrow margin of uninfiltrated tissue. To-day, with our accumulated experience, I believe it would be possible in such a case to save the radius even if it were necessary to remove with the Gigli saw portions of the bone near the tumor and to transplant a piece of bone into the defect of the ulna.

CASE I (Pathol. No. 6125).—In February, 1905, Dr. Halsted resected the lower ends of both bones of the forearm for a giant-cell sarcoma of the lower end of the radius. This patient has remained well seven years. The function of the hand is not particularly good. When we study the X-ray (Fig. 16) from the view-points of our recent experience I think we are justified in concluding that the ulna could have been saved, the tumor resected, and bone transplanted. Such a procedure would have given the patient an equal promise of a cure with less mutilation.

CASE II (Pathol. No. 8680).—In January, 1908, Dr. Miller, then resident surgeon of the Johns Hopkins Hospital, resected the lower ends of both bones of the forearm and some carpal bones for medullary giant-cell sarcoma of the lower end of the radius. The X-ray picture does not differ from that of the previous case (Fig. 16). I studied the specimen sent to the laboratory most carefully: the tumor was everywhere most distinctly encapsulated; it could have been removed without injury to the ulna, and bone could have been transplanted.

The medullary cavity of the lower end of the radius seems to be a very common situation for this giant-cell sarcoma—in 9 out of 23 of the personally studied cases the tumor has been situated here. In four of these cases amputation was performed, of course, unnecessarily. In two of these, I am confident from my study, curetting would have been sufficient; in the remaining two resection would have been indicated,

as the bone shell had been destroyed by the disease. In two cases the local resection was too extensive in that the ulna was unnecessarily removed. One most favorable case refused the suggested amputation. Unfortunately I have been unable to follow this patient. The case curetted by Dr. Chambers is well, and the functional result is perfect. The patient, in whom I transplanted the ulna into the radial defect after removal of the recurrent tumor, has a much better functional result than was achieved in the two cases in which the ends of both bones of the forearm were removed.

The study of these nine cases of medullary sarcoma of the radius from the first amputation in 1895 to the first curetting in 1908 is a good historical review of the development of our knowledge of the disease and of its treatment without mutilation.

CASE III (Pathol. No. 10975, operator Bloodgood, November 11, 1910).—Resection of the upper third of the tibia with later transplantation of a portion of the split tibia into the defect with the transplantation of the articular surface of the patella in an attempt to make a knee-joint.

This case has many points of interest and is instructive in the development of the technic of bone transplantation. The patient was a white female aged twenty-six. Three years and three months before she came under my observation she began to have pain referred to the head of the tibia; at first the pain would be present a day and disappear. Now and then it would keep her awake a few hours at night. These attacks of intermittent localized pain continued for one year, and she was treated for rheumatism.

In the cases of sarcoma of bone without the history of a trauma this localized pain is the usual symptom of onset. The patient had sufficient pain to consult a physician, yet no one suggested an X-ray. At the end of the year she noticed a swelling of the upper end of the tibia. There was no restriction of joint motion. One year and three months after the onset of pain the patient consulted Dr. H. E. Ashbury, of Baltimore, through whose courtesy and interest I later was given opportunity to treat this patient. Dr. Ashbury took an X-ray and found a localized focus in the

upper end of the tibia. He does not remember its exact location, but feels quite sure that it was below the epiphyseal line; it was situated in the cancellous bone and had a broad zone of uninvolved bone around it. Unfortunately this plate has been lost. If I could reproduce it here, it would become historical as the first X-ray of a giant-cell sarcoma before it had destroyed bone to the outer table. The patient then refused operation. The swelling continued, and when I saw the patient two years later there could be little doubt about the diagnosis of either a bone cyst or a giant-cell sarcoma. Fig. 17 is a photograph of the patient, Fig. 18 the second X-ray taken by Dr. Ashbury. There is nothing in the clinical picture nor in the X-ray to exclude a bone cyst. In some respects the abrupt expansion of the tibia and the X-ray shadow suggest a bone cyst. Before I explored the tumor I felt that the chances favored a giant-cell sarcoma, because in many places the bone shell had been entirely destroyed, and there was distinct parchment crepitation. There was no pulsation. On dividing the capsule I encountered the typical giant-cell sarcoma tissue which has been described in my previous communication. To curette this tumor would have left conditions identical with resection—the simpler procedure. I therefore divided the tibia below the tumor and dissected the tumor capsule from the surrounding muscle without injury to nerves or vessels. The articular cartilage of the head of the tibia had to be removed, because it rested upon tumor tissue, as shown in Fig. 19. This resection was a simple procedure; it required some time, however, after removal of the Esmarch to check all the bleeding points, and, in view of the patient's condition, it was decided to close the wound and transplant bone later. The patient was a bad subject for operation, as she was nursing a child and had secondary anæmia associated with intestinal parasites. The wound healed *per primam*. On December 3, 1910, about three weeks later, when the patient's condition had greatly improved, I opened the wound which had healed well, exposed the remaining portion of the tibia, divided it longitudinally until I had a piece long enough to fill the defect, sawed off the head of the fibula, sawed off the articular surface of the patella, placed this patella on top of the fibula and transplanted the piece of tibia so that the articular surface of the patella rested against the condyle of the femur. These bones were fixed in position with wire and screws as shown in the

diagram (Fig. 20). I divided the piece of the head of the fibula in half and fixed these two pieces (see diagram) in order to observe their behavior. This wound also healed *per primam.* Fig. 21 shows the X-rays taken some weeks after operation, and Fig. 22 the X-ray taken May, 1912, one year and six months after operation.

There is no doubt in this case that new bone has formed from all the transplanted pieces. Although I sutured the patellar ligament to the transplanted piece of tibia, the patient has very little active extension (Fig. 23), but her chief difficulty is a slightly flail joint from weak lateral ligaments. She, however, gets about very well with a supporting apparatus, without crutches, and does not wish any further attempt to improve function. I am confident now, that with transplantation of fascia we could increase the strength and function of this knee-joint. I think this case demonstrates that we can resect very long continuous pieces of the long pipe bones with the joint surface, filling the defect with transplanted bone and fascia, and thus give the patient a very serviceable limb. The technic of this transplantation in the upper extremity is less difficult than in the lower, but it is gradually being worked out.

Case IV (Pathol. No. 11855, operator Bloodgood, August 3, 1911).—In this case a tumor of the upper end of the fibula was resected. Fig. 24 is the X-ray taken before operation, Fig. 25 shows the specimen removed from a position similar to that in Dr. Chambers's case (Figs. 7, 8, and 9) which he curetted. But in this case there was less bone shell and for this reason no object in curetting. There was no periosteum to re-form bone. The dissection preliminary to resection was the simpler procedure, and I did not think it necessary to transplant bone into the defect (Fig. 26). I had had an experience with osteomyelitis of the upper end of the fibula in which the entire upper end of the shaft had been destroyed, and the bone did not re-form after the removal of the sequestrum and drainage of the abscess. Yet this patient had no weakness of the leg and suffered no inconvenience, except from a toe-drop due to injury of the external popliteal nerve, from

which he gradually recovered. Although I carefully exposed the nerve in this case of giant-cell sarcoma, I must have had too much tension on it during the dissection, because after operation the patient had all the sensory and motor signs of paralysis of the external popliteal nerve. Dr. Chambers informs me that in his case in which he removed the tumor with the curette from the upper end of the fibula, the patient shows paralysis of the external popliteal nerve. Both patients walk well.

These three cases demonstrate that for a tumor in the upper third of the fibula it is not necessary to transplant bone into the defect after the resection. However, if the continuity of the bone can be preserved by removing the tumor with the curette, there is no reason why curetting may not be attempted. But it should be remembered that in this locality complete removal of the bone has no functional disaster, so one need run no risks with curetting.

CASE V (Pathol. No. 12474, operator Bloodgood, February 23, 1912).—Resection of the lower end of the ulna; transplantation of piece of ulna into the defect. Good functional result.

This case is of interest in presenting the question of the relation of trauma to sarcoma. The patient was referred to me by Dr. George Ben Johnston, of Richmond, Va. He is a white male aged forty-eight. In June, 1911, about eight months ago, without any previous symptoms, he sprained the right wrist by a twist while cranking an automobile. There was no contusion. For at least two months he continued to have discomfort in this wrist, chiefly in supination. With these symptoms an X-ray was indicated, but he had not consulted a physician. He, therefore, had not been educated to the importance of an X-ray picture after a simple sprain. In November there was a second injury while he was lifting a box. The discomfort was of shorter duration. In December there was a third sprain. As the symptoms after this last injury did not subside, he consulted a physician, who treated it as a sprain. Here the physician had not been educated to the importance of an X-ray investigation. January 6 the patient noticed a swelling. This frightened him and his physician, and the X-ray was taken. (Fig. 27.) Case III, as I have stated, pictures clearly the importance of persistent localized pain in a

bone or joint as a symptom which should make X-ray examination imperative. This case illustrates the importance of an investigation with the X-ray when the symptoms of a relatively slight injury do not disappear quickly. Both laity and the profession must be informed of these facts.

The operation in this case was very simple. The tumor (Fig. 28) had so destroyed the bone capsule that it seemed not worth the while to try the curette. If this tumor had been in the radius, I should have attempted it. The resection was a simple procedure. The longitudinal division of the ulna with the Gigli saw was more difficult, but the shaft was split with the saw, and the piece transplanted and fixed as shown in the X-ray after operation (Fig. 29). This was done about three months ago. The period of disability was longer than if the tumor had been recognized earlier, at a time when it could be removed with the curette. The patient now has entirely recovered with good function.

It was this case more than any other factor which stimulated me to make this second report before this Association of surgeons. Although much has been written about the conservative treatment of giant-cell sarcoma, yet there seem to be but few surgeons willing to follow the advice. This patient told me that a number of members of the profession thought it was safer to have the arm removed; others rather favored resection, but preferred somebody else to do it. Then Dr. Coley, of New York, advised him to have the serum treatment before and after operation to prevent a recurrence. Quite naturally this patient is of the opinion that the American profession entertains radically different views in regard to the treatment of bone sarcoma, and I am quite confident that he will be anxious about the result for some years. I think I may confidently state that if this tumor had been removed from the lower end of my own ulna I should have no more anxiety about its recurrence than I would about the recurrence of appendicular attacks after the removal of my appendix.

CASE VI (Pathol. No. 12927, operator Dr. Emil G. Beck, of Chicago).—The tumor was situated in the lower end of the radius. Dr. Beck writes me that he considered the possibility of curetting, but as the tumor had destroyed so much of the

bone, he decided to do a resection. The X-ray before operation is shown in Fig. 30. It appears to me from the study of this X-ray that it might have been possible to remove the tumor with the saw and chisel, saving the uninvolved bone on the radial side as shown in the illustration and to transplant into the defect a piece of bone taken from the uninvolved shaft of the radius above.

Cases of Medullary Giant-cell Sarcoma which have Remained Well After Resection in Continuity, Collected from the Literature.

NASSE: Patient aged 49; symptoms six months; tumor in lower epiphysis of tibia. Well five years after operation.

GEBAUER: Patient aged 22; duration of symptoms not stated; situation lower end of radius. Well six years.

GEBAUER: Patient aged 12; situation lower end of radius. Well four years.

HAHN: Patient aged 20; situation head of humerus. Well 12 years.

KUDLEK: Patient aged 25; symptoms 18 months after trauma; situation patella. Well two years.

BLECHER: Patient aged 21; symptoms six months after trauma; situation humerus. Subperiosteal resection. Well 18 months. This patient had a pathological fracture three days before operation.

MORTON: Patient aged 40; symptoms six months; situation upper one-third of tibia. Well one year and three months.

MORTON: Patient aged 39; symptoms six months; situation upper one-third of tibia. Well six months.

MORRIS (reported by Morton): Lower end of radius. Well 13 years.

LUCAS (reported by Morton): Lower end of ulna. Well ten years.

SUTTON (reported by Morton): Sternal edge of clavicle. Well four years.

CLUTTON (reported by Morton): Lower end of radius. Death 18 months from nephritis.

CLUTTON (reported by Morton): Radius. Well two years.

KOCHER: Patient aged 18; situation ulna. Well 17 years.

KOCHER: Patient aged 19; situation radius; resection of radius and ulna. Well 7 years.

CASES OF MEDULLARY GIANT-CELL SARCOMA WHICH HAVE RECURRED AFTER RESECTION IN CONTINUITY.

Among my 23 personally-studied cases I have one such observation (see Case II, Pathol. No. 8412, p. 222). In this instance there had been two curettings of a tumor of the lower end of the radius and one resection—apparently all three incomplete. I resected the recurrent tumor, transplanted a piece of ulna into the defect, and the patient has remained well five years since operation.

In the literature I can find but one case, reported by Kocher. The patient was aged forty-five; the tumor situated in the upper end of the left fibula. The head of the fibula was resected. One year later the leg was amputated for a recurrence. In the report (*Beitr. z. klin. Chir.*, 1906, vol. i, p. 135, Case 42) no details are given of the resection nor of the ultimate result after the amputation. It is stated that the tumor was a giant-cell sarcoma. The X-ray (Plate VI, Fig. 5) shows a small expanding tumor in the head of the fibula with a thin bone shell. The picture resembles very closely my case at the lower end of the ulna (Figs. 27, 28, and 29).

In the microscopic study of the case, in which I resected the upper end of the tibia (Figs. 17, 18, 19, 20, and 21) and later transplanted bone, I found the tumor had infiltrated muscle beyond its capsule. I disinfected this wound, before removing the Esmarch, with pure carbolic acid followed by alcohol. I felt at the time of the resection that I gave the tumor a very narrow margin at its lower end, so that at the second operation for transplantation I resected this piece of bone with the surrounding granulation tissue and muscle and redisinfected with the Paquelin cautery, followed by carbolic acid and alcohol. Microscopic study of this tissue shows the presence of giant-cells. Whether this means that the giant-cell tumor was still present, I do not know. They may be osteoblasts in granulation tissue. There has been no recurrence now one year and five months after operation.

In the first case in which I curetted the tumor from the upper end of the tibia (Case I, Pathol. No. 4520, Figs. 1 and 2) I found giant-cells in the granulation tissue lining the bone cavity, but there has been no recurrence now more than nine years since operation.

In Case IV (Pathol. No. 11855, p. 228, Figs. 25, 26, and 27) in which I resected the tumor from the upper end of the fibula, I found the giant-cell tumor in the muscle outside of the capsule.

The point that I wish to make here is this: In performing

resection, one should also disinfect the wound just as in cases after curetting. The indication for resection of a giant-cell tumor is the destruction of the bone capsule. When this happens, there may be infiltration beyond the capsule, and as it may be necessary to cut close to the capsule to avoid important nerves and vessels, it is quite possible that tumor tissue may be exposed.

Judging from the few recurrences, however, after resection this is a remote possibility, but I think it should be borne in mind, and the technic which I have always employed and described here should be followed.

CASES OF MEDULLARY GIANT-CELL SARCOMA SUBJECTED TO PRIMARY AMPUTATION.

Among the 23 cases of which I have records in the Surgical Pathological Laboratory, amputation was performed in nine. In four cases the tumor was situated in the lower end of the radius. I have already discussed and shown that amputation was unnecessary. In five cases the tumor was situated in the lower end of the femur. I am inclined to the opinion to-day that it would have been justifiable in some of these cases to attempt curetting with the transplantation of a piece of bone into the bone cavity. In every case, I am confident, resection would have given equal assurance of a cure and, with our modern methods of bone transplantation, a serviceable lower extremity. I have never had the opportunity to attempt curetting of this tumor in the lower end of the femur. Taylor, of Philadelphia, to whose case I have already referred, made such an attempt in 1906, but encountered so much hemorrhage that I doubt whether the curetting was really radical enough.

Kramer, whose case I have already recorded, was successful. His patient is well 12 years after the curetting of a tumor situated in the lower end of the femur. He does not describe his case in great detail, and there is no X-ray. He states, however, that the tumor at every point was surrounded by a bone shell; the tumor was composed of soft, vascular, red tissue, and under the microscope was composed almost entirely of giant-cells. It is quite possible that in Kramer's case only

one condyle was involved as in DaCosta's case, which, as has been stated, recurred after curetting, but remained well after resection.

The curetting of a giant-cell sarcoma from the shaft of the femur as done successfully by Karewski does not appear to me as difficult a procedure as when the lesion is in the condyles.

Hinds in his report (*British Med. Jour.*, Feb. 26, 1898; discussed by me in *Progressive Medicine*, December, 1899, p. 242) writes that the growth involved both condyles of the lower end of the femur and extended four inches up into the medullary cavity of the shaft. Hemorrhage in this case was controlled with an Esmarch. After curetting the surface of the shell of bone was scrubbed with a solution of chloride of zinc and the wound tightly packed. Six weeks later the cavity was again curetted and scrubbed with zinc chloride. This case reported as well two years and six months after operation demonstrates that curetting may be attempted in the lower end of the femur even though both condyles are involved. It also suggests that in extensive cases one may repeat the curetting and disinfection and then later hasten the healing of the bone cavity by bone transplantation.[2]

So far, in the literature, I have found only these two cases of Kramer and Hinds, in which curetting a tumor in the lower end of the femur was successful. Taylor and DaCosta, of Philadelphia, experienced recurrences, but perhaps their technic of curetting was not as radical. As I have noted before,

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[2] Dr. Frank Hinds writes me under date July, 1912, that this patient, now almost seventeen years since operation, is free from recurrence. He works as a wheelwright, the limb is strong, but there is not much motion at the knee-joint, and there is a short sinus communicating with the old bone cavity which gives no discomfort. Dr. Hinds very kindly sent me a section from the original tumor—it is a pure giant-cell tumor. He also contributes a print from the X-ray taken under the date of the letter (see Fig. 33). I should consider this case perhaps the greatest triumph for curetting in the treatment of the giant-cell tumor, as it demonstrates that it is applicable to this tumor in the lower end of the femur even when both condyles are involved.

Taylor did not use an Esmarch and did not disinfect (see Fig. 31 of my previous report).

Among the 25 cases which I have collected from the literature, in only five was amputation performed primarily.

This evidence should support the chief contention of this contribution, that amputation is rarely, if ever, an operation of selection for giant-cell sarcoma. It might become an operation of necessity in those cases in which the tumor has infiltrated the soft parts to such an extent that radical removal would leave a useless extremity. As a matter of fact, this rarely if ever happened, except in very neglected cases.

The cases of giant-cell sarcoma which I have personally observed and which have been collected from the literature and considered in this paper may be summarized as follows: (1) cases cured by curetting, 11; (2) cases recurring after one curetting, cured by a second curetting, 1; (3) cases recurring after a curetting, cured by later resection, 3; (4) cases recurring after a curetting, cured by later amputation, 1; (5) cases which remained well after resection, 21; (6) cases which have recurred after resection, but remained well after amputation, 1; (7) cases subjected to primary amputation, 14.

I have been able, therefore, to study pretty carefully 52 cases. I am confident I could get a great many more from my colleagues in America. It is difficult to get the cases in the literature, except those reported under the title "Giant-cell Sarcoma." In such cases the operator has made the report because of his conservative treatment. Many of our cases were sifted from general reports from surgical clinics. I am confident that many of the cases of sarcoma of bone which have remained perfectly well after amputation belong to this group. After Dr. Wyeth's paper in Philadelphia in 1901, I tried to ascertain the pathology of the cured cases. It was very difficult, however. Fortunately one of the cases had been treated by Dr. Sherman, of San Francisco, and tissue had been preserved. It proved to be a giant-cell sarcoma. I am continuing this search and am inclined to the view that

if tissues are preserved in any of these cases, I shall find the tumor in the majority of cases to be giant-cell sarcoma.

In conclusion we may emphasize the following points:

1. Up to the present time we have no proof that the pure giant-cell sarcoma ever metastasizes. It is a question, therefore, whether it should be called a sarcoma.

2. Conservative treatment is justifiable. Curetting should, in some localizations of the tumor, be the operation of choice. But in those localizations where resection in continuity does not interfere with function, resection becomes the operation of choice; for example, upper end of fibula, lower end of ulna.

3. It is justifiable to attempt curetting to preserve function, even when conditions suggest a great probability of recurrence. There is no position where curetting is not justifiable as a first attempt. It has succeeded when the entire lower end of the femur was involved.

4. Among 26 cases subjected to curetting there were five recurrences: one has remained well after a second curetting; three after resection, and one after an amputation. I am confident that the number of successful cases of curetting will depend chiefly on the number of attempts.

5. Twenty-two cases were subjected to primary resection: one recurred and was cured by amputation.

6. As I found only five cases in the literature of giant-cell sarcoma subjected to primary amputation, and there are nine in my own list, one can feel pretty certain that many of these cases are not reported, except in statistical studies from large clinics.

7. After curetting or resection, the wound should be disinfected with pure carbolic acid followed by alcohol or chloride of zinc solution. The operation should always be done, if possible, under an Esmarch.

This procedure is not indicated because of the malignancy of the giant-cell tumor, but because in curetting we leave cells and disseminate cells, while in resection we may inadvertently cut into the tumor. There is apparently no danger in recurrences, except that they subject the patient to a second operation and perhaps more mutilation.

8. It is not necessary to perform the bone transplantation at the primary operation unless a single bone like the humerus or femur is divided in its continuity. In simple cases there is no reason why the transplantation should not be performed at the same time, but in some cases the resection may be tedious and bloody, and the patient may not be in good condition. In such cases it will be safer to transplant at a second operation.

9. I think I am the first to recommend and to practise direct transplantation into the bone cavity after curetting (Figs. 31 and 32). I am sure that this procedure will grow in value and importance as we attempt curetting more frequently.

10. My experience teaches me that it is simpler, when possible, to get the bone for filling the defect by splitting the bone which has been resected. This can be accomplished through a single wound. When this cannot be done on account of the large defect, one can remove the upper third of the fibula without injury to the function of the limb, or chisel large pieces from the tibia without destroying the continuity of the bone.

11. In every case in which the X-ray shows a medullary shadow the urine should be examined for Bence-Jones bodies; the latter indicate the presence of a multiple myeloma, or metastatic carcinoma.

12. I would caution against the surgeon making a positive diagnosis of either a bone cyst or a giant-cell sarcoma. The more X-rays I see, the less confidence have I in my ability to make a differential diagnosis, except in the later stages.

13. The positive diagnosis must be made at the exploratory incision. The bone cyst as a rule can be recognized by its blood-stained contents; the giant-cell sarcoma by its red, vascular tissue, which looks like granulation tissue. But the giant-cell tumor often has white areas of ostitis fibrosa and the ostitis fibrosa often red giant-cell areas. The two are often mixed. One tissue, however, predominates. The less experienced surgeon should always aid himself with a frozen section. The giant-cell tumor occurring as a blood cyst may

be encountered, as in Davis's case. The rare bone aneurism discussed in my previous report will be difficult to differentiate from the giant-cell tumor of the type described by Davis. Since my first report I have had one other observation in which the hemorrhagic tissue forming the wall of the blood cavity resembled closely a giant-cell sarcoma, but the frozen section demonstrated the practical absence of giant-cells.

From this investigation it is my opinion that it might be well to drop the term " giant-cell sarcoma," as it gives a wrong impression of the malignancy of the lesion, and use, at least temporarily, the designation " giant-cell tumor." F. B. Mallory, of Boston (*Jour. of Med. Research,* 1911, vol. xxiv, p. 463), is also of the opinion that it is a question whether this giant-cell tumor should be called a sarcoma.

In the gross and microscopic studies of benign bone cysts, ostitis fibrosa, and this giant-cell tumor, I am forced to the conclusion that there may be some relationship between these pathological processes. Very frequently, in the bone cysts and ostitis fibrosa, we find, in the gross, currant-jelly areas which cannot be told, under the microscope, from the giant-cell tumor, and in the latter we often find white areas histologically identical with ostitis fibrosa. At the present time the majority of investigators look upon the bone cyst and ostitis fibrosa as an inflammatory lesion. Perhaps the giant-cell tumor is a further pathological process in this as yet obscure bone condition.

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THE RADICAL OPERATION FOR THE RELIEF OF CANCER OF THE RECTUM AND RECTOSIGMOID.*

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THE true rectum lies between the levator ani muscle and the third sacral vertebra and consists of the so-called second part of the rectum, as designated by American authors. It is derived from the cloaca, which is a highly differentiated part of the hind gut, and has five sources of blood supply, all of which may be accompanied by lymphatics. The superior rectal and the middle hemorrhoidal arteries contribute the main blood supply, however, and the lymphatics, which are scanty, usually pass along with these blood-vessels by way of the rectal, sacral, mesosigmoid, and internal iliac glands to the juxta-aortic group.

The rectum proper has no mesentery and only a small part of its anterior surface is covered by peritoneum; it lies in the fatty supporting tissue inside the rectal fascia between the genito-urinary organs ventrally and the sacrococcygeal frame-work dorsally. Carcinomata of the true rectum are covered by peritoneum ventrally to some extent in more than half the cases. The type is adenocarcinoma.

The so-called first portion of the rectum has been shown by Treves [1] and Jonnesco [2] to be the terminal portion of the sigmoid derived directly from the hind gut, and its lymphatics pass to the aortic group by way of the mesosigmoid, following its single source of blood supply. All the growths in this situation are covered by peritoneum ventrally. The type is adenocarcinoma. Only 24 per cent. of rectal cancers lie completely below the peritoneum (Tuttle [3]).

The so-called third portion of the rectum is derived from the ectoderm or skin fold, and its lymphatics drain into the

* Read before the American Surgical Association, May 29, 1912.

inguinal and coccygeal glands as well as upward into the rectal glands. The anal canal is about one and one-fourth inches in length, contains no glands, and is lined by pavement epithelium. This part is the primary source of malignant disease in about 6 per cent. of the cases of cancer of the rectum. The type is epithelioma.

Operation for cancer has two principal objects: (1) complete removal of the local focus with such adjacent tissue as might possibly be affected, and (2) the removal, to as great an extent as possible, of the tributary lymph-nodes. To accomplish these objects in operating upon the true rectum for cancer means the removal of the entire organ with such a destruction of the muscles and nerves as will probably render efforts at securing a controllable anus impossible. While a brilliant result is occasionally obtained by drawing the sigmoid downward and passing it through the muscles of the anal canal from which the mucous membrane has been removed, such fortunate instances are rare. In most cases there results a preternatural anus at the normal situation, and this latter condition cannot be considered a restoration, but merely a sentimental attempt to place what amounts to colostomy at an unfortunate situation—the anal site. This is especially true if the muscles and nerves have been seriously damaged; in such cases an abdominal colostomy or a sacral anus will give as good or better results at a smaller risk. However, each case must be judged on its individual merits; an attempt to conserve function must not be allowed to result in failure to eradicate the disease.

Handley [4] has shown that carcinomatous implantation may be found in the bowel six inches above the visible expression of the disease. Fagge [5] has demonstrated, in two cases, an extension downward into the lymphatics of the anal canal without *visible* involvement of the canal itself. In Fagge's opinion, with which I agree, the entire anal canal should be removed when the carcinoma has its origin in the rectal ampulla.

The necessity of a wide eradication of the disease with at

least six inches of apparent sound bowel above and not less than two inches below, with all the surrounding fat and glands, usually means a permanent colostomy in some situation. The functional incapacity following the operation must be accepted by the patient as the price paid for the cure. Occasionally a case may be found early enough so that the disease can be removed locally with success. In five instances in the clinic in St. Mary's Hospital cancer of the rectum was discovered early enough to enable us to remove the focus by a purely local operation and no recurrence followed. In a few of our cases the strictly local nature of the disease seemed to justify a limited resection of the rectum with direct suture in continuity, but in the greater number of cases such operations cannot be considered, as they either subject the patient to an operation which is not radical and gives but a faint hope of cure or greatly increase the danger of sepsis from leakage.

Failure to remove the disease in an orderly manner, and not the natural tendencies of rectal cancer, is responsible for the pessimism of the profession toward the radical operation for removal of malignant growths in the rectum and rectosigmoid.

High-lying carcinomata of the rectum, in the so-called first portion of the rectum, in the large majority of cases can be considered to have their origin in the terminal sigmoid. Since, in most of these cases, the rectum is involved in its upper portion and in all it must be removed to a great extent, it is wise to consider all high rectal and terminal sigmoid growths in one group as rectosigmoid. They form a very considerable percentage of carcinomata of the rectum, and when localized are extremely favorable for curative operation.

In a limited number of cases the sigmoid can be anastomosed to the lower rectum by the tube method after resection, but in a considerable percentage, and perhaps the majority, the disease involves the rectum extensively and an operation cannot be considered complete which does not remove the entire rectum and lower sigmoid.

Colostomy through the left rectus muscle, as advocated by

Lilienthal,[6] gives good functional results, and, as contrasted with a preternatural anus in any other situation, is to be preferred. A colostomy in the rectus muscle can be controlled by a simple abdominal binder—the weight of the abdomen in the bandage making the gentle pressure that is necessary for closure. The rectus muscle is as controllable as the biceps, and temporary voluntary control is often obtained, even against gas and fluids. Iliac colostomy, on the contrary, is placed in a situation where pressure must be brought by a pad or some other artificial means; the control may be efficient but generally does not bear comparison with that obtained when the opening is made through the rectus muscle.

If the colostomy be done as a primary operation to be followed later by radical removal of the disease, it allows thorough evacuation of the bowels and careful cleansing of the distal fragment before undertaking the second operation. When it is considered that 90 per cent. of the deaths following operation are due to sepsis,[7] the importance of this step cannot be over-estimated.

A sacral anus is fairly well controlled by proper apparatus, and the average patient is, for sentimental reasons, better pleased with a colostomy behind, as that after all is what a sacral anus amounts to, than with a colostomy in front.

Operability.—Carcinoma of the rectum and rectosigmoid remains a local condition until a late stage. I have never seen a case in which a locally removable carcinoma in this situation has been inoperable because of glandular metastases alone. We have not infrequently seen cases which were locally removable and fairly free from glandular metastasis, but in which the liver was involved in embolic carcinoma. This is especially true in the young. In a few instances we have seen peritoneal metastases and implantation carcinoma in the mucous membrane both above and below the primary seat of the disease in cases locally operable.

In many cases rectal examination will not determine whether or not the disease be locally removable, and, since it

is essential to know that there are no irremovable metastases in the abdominal cavity, an intraperitoneal exploration should constitute the first step in operating on cancer of the true rectum and rectosigmoid, and not until this be done and the disease viewed from above can the question of rectal conservation be settled. This, however, should not be considered an arbitrary law. In the very obese, the cachectic, and those in poor physical condition from general diseases a single operation by the perineal or sacral route may be preferred to a method which requires two operations, although an occasional patient may be operated upon radically who has abdominal metastasis unknown to the operator because unexplored.

Inoperability is usually due to extension anteriorly to the region of the genito-urinary organs. When the mucous membrane of the bladder is affected and there is mechanical difficulty in micturition, an operation is not only futile but has also considerable mortality.

Involvement of the peritoneum and muscular coats of the bladder is not unfavorable to operation, and on a number of occasions we have removed a part of the bladder wall down to the mucosa with good results. Involvement by direct extension to the uterus does not mean inoperability. If necessary, the uterus with both ovaries and tubes can be removed at the same time. This was done in five of our cases. Carcinomata implanted upon the ovaries and pelvic peritoneum, however, are much less favorable for operation. The very fact that these carcinomatous cells have been loose in the peritoneal cavity means that other organs may be involved, although, on account of the rapidity of the progress of the disease in the ovaries, they are the only organs manifestly affected at the time.

The prostate and seminal vesicles, when involved in the carcinoma, can easily be removed to such an extent as may be necessary, but the prospect of cure is poor. In one patient we removed an inch of the posterior urethra and a piece of the bladder, followed by direct suture; the prostate and right seminal vesicle were also removed. The patient recovered

with control of the bladder. We have dissected the ureters from the bladder to the brim of the pelvis in a number of cases, and after covering them with vaseline, have allowed them to drop back into position. Ureteral fistula has not followed in any of these cases. We have found that if the ureters are thoroughly covered with vaseline after separation and denudation, both in this operation and the complete abdominal hysterectomy of Wertheim, ureteral fistula has not occurred. Gauze should not be allowed to come in contact with the denuded ureter in the drainage. It has been said that few cases of cancer of the rectum are operable beyond nine months after the beginning of the symptoms. This is an error. A number of our cases in which the symptoms had existed more than two years proved to be in excellent condition for operation. Much of the reputation of colostomy as a palliative operation depends on the fact that cancer of the rectum is a slow process and long remains a local disease. These extensive operations, however, can only be made with a justifiable mortality where a preliminary colostomy has been done and the rectal fragment has been carefully cleansed.

Two years ago I presented a report of 120 cases of resection of the rectum.[7] Since then we (C. H. and W. J. Mayo) have operated on 71 additional cases. I wish briefly to review these with special reference to the operative methods and immediate mortality, reserving the question of ultimate results for a future report.

For convenience, the 71 cases submitted to radical operation from January 1, 1910, at which time the former statistics ended, to April 1, 1912, have been divided into two series: (1) Operations through a perineal or posterior incision in a single stage; (2) operations through the abdomen or abdominal combined with a perineal or sacral incision in one or two stages. Each will be discussed separately.

1. Operations Through the Perineum or a Posterior Sacral Incision in a Single Stage.—In this series there were 27 cases with 2 deaths (7 per cent.).

(*a*) *Local Operations.*—It is the rule in our clinic that the rectum shall be examined digitally in practically all of the cases in which an abdominal or pelvic complaint exists, whether or not there be rectal symptoms. Thus we have, on five occasions as previously mentioned (two in this group of 71), discovered carcinoma as a small localized mass from the size of a bean to that of a filbert, in patients with few or no rectal symptoms. Two of these were in degenerating polyps. Under an anæsthetic and after careful dilatation of the sphincter, a clamp was placed in such a manner as to bring up the growth with a wide zone of normal mucous membrane. The carcinoma was cut away with scissors and the base slowly seared with a hot iron. In one case it was necessary to use a catgut suture in addition. These five patients have all remained well.

(*b*) *Cripps's Perineal Resection.*—In this group there were five cases with no deaths. All involved the anal canal. The tumor, with a good margin of skin about the anus, the sphincters and a wide area of fat, the anal canal and a sufficient amount of the ampulla of the rectum were removed. The rectum above was not loosened from its bed and no attempt was made to unite the skin to the stump of the rectum. With a little care in the use of bougies in the third and fourth week, to prevent contracture, the functional results were excellent. In two of these cases the inguinal glands were removed at the same time. Undoubtedly it is good practice to remove the inguinal glands in all of these cases.

(*c*) *Quenu-Tuttle Perineal Resection.*—In this group there were 12 cases with one death (8⅓ per cent.). This operation is most properly applied in women. It consists, with or without removal of the coccyx, of a rapid dissection of the entire rectum from the hollow of the sacrum through a posterior straight incision. The dissection is extended anteriorly until the peritoneal cavity is opened. A gauze pad is placed inside the peritoneal cavity. The entire rectum is separated from its lateral attachments, which are caught in the forceps much as are the broad ligaments in vaginal hyster-

ectomy. Compression in the clamps for a few minutes, as pointed out by Bevan,[8] stops all tendency to bleeding from the hemorrhoidal vessels. As a rule the entire mass can now be drawn through the incision with little difficulty. The superior rectal artery is tied and the proximal stump of sigmoid cauterized with the Paquelin cautery. In many cases the anal canal can be saved, and after stripping of its mucous membrane the lower end of the tied sigmoid is drawn through and fastened. We have followed Peck's[9] advice, leaving the stump closed for from 24 to 72 hours before opening, and have obtained primary union in some cases. The patient is operated in the perineal position. This operation is indicated in very fleshy, elderly females in whom any kind of an abdominal operation would be fraught with great difficulty and danger, and in patients who are cachectic and anæmic. Of these 12 cases, two were extremely anæmic from continued loss of blood, one having 22 per cent. hæmoglobin and the other 28 per cent. Both made good recoveries. In the male this method does not give a sufficient view of the genito-urinary apparatus. In the female the bladder is protected by the uterus and vagina.

(*d*) *Posterior Resection of the Kraske Type* (Fig. 1).—Eight primary operations were made by the posterior route with one death, and 30 secondary to an abdominal operation with four deaths. This method as a primary one-stage operation was chosen in fleshy males and in several females with strictly localized growths well above the anal canal. In five the tied end of the sigmoid was drawn down through the anal canal, which was stripped of its mucous membrane. In three cases the functional results were good. In two the end of the sigmoid sloughed and separated from the muscles and the functional results were poor. In one, a rectosigmoid growth, direct suture in continuity was made over a tube. A sacral anus was made in the remaining two cases.

In the posterior operation we have followed the plan of putting the patient on the operating table in the reverse Trendelenburg posture (Fig. 1), closing the anus by suture

and making an incision in the posterior mid-line eight or nine inches in length from the upper sacrum to the anus. The coccyx and the fourth and fifth sacral vertebræ are removed, which gives a fairly good operative space (Fig. 2). The dissection is then made usually from below upward. It should be accurate and anatomic, exposing the posterior urethra, prostate, seminal vesicles, and posterior wall of the bladder in the male, the vagina and uterus in the female, and, as a rule, the ureters in both sexes. Hochenegg [10] has had a large experience in posterior resections for rectal cancer. I have recently had the pleasure of seeing Prof. Hochenegg do his operation. In removing the fourth and fifth sacral vertebræ he makes the bone section slightly concave from below upward. He has no difficulty in removing growths which can be barely reached by the examining finger. In two-thirds of the cases operated a sacral anus is made. Five hundred cases have been operated in the Vienna clinic by the Hochenegg method with a mortality of 18.9 per cent. and 20 per cent. of five-year cures. In his private work, Hochenegg has a mortality of a little less than 10 per cent.

2. Abdominal and Abdominal Combined Operations in One or Two Stages.—This series contains 44 cases with 9 deaths.

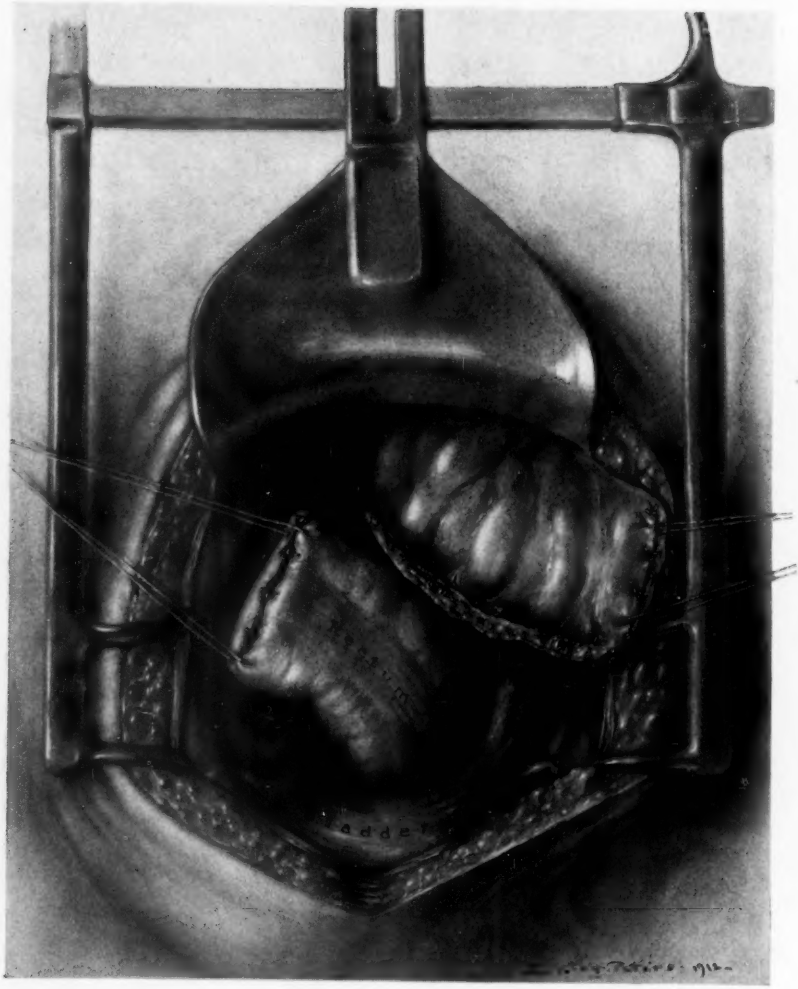
(*a*) *Abdominal and Abdominoperineal Operations in One Stage.*—There were 14 cases with 5 deaths in this group.† The lower sigmoid and rectum were removed through the abdomen or abdomen and perineum at a single operation. An incision is made in the mid-line, suprapubically, sufficient to admit the hand for exploration. The patient is elevated into a sharp Trendelenburg position and the incision is extended until it

. † The operative mortality is based on counting as a death from operation every case dying in the hospital without regard to cause of death, or length of time thereafter. Some of these deaths occurred from exhaustion and general debility several weeks after operation.

FIG. 1

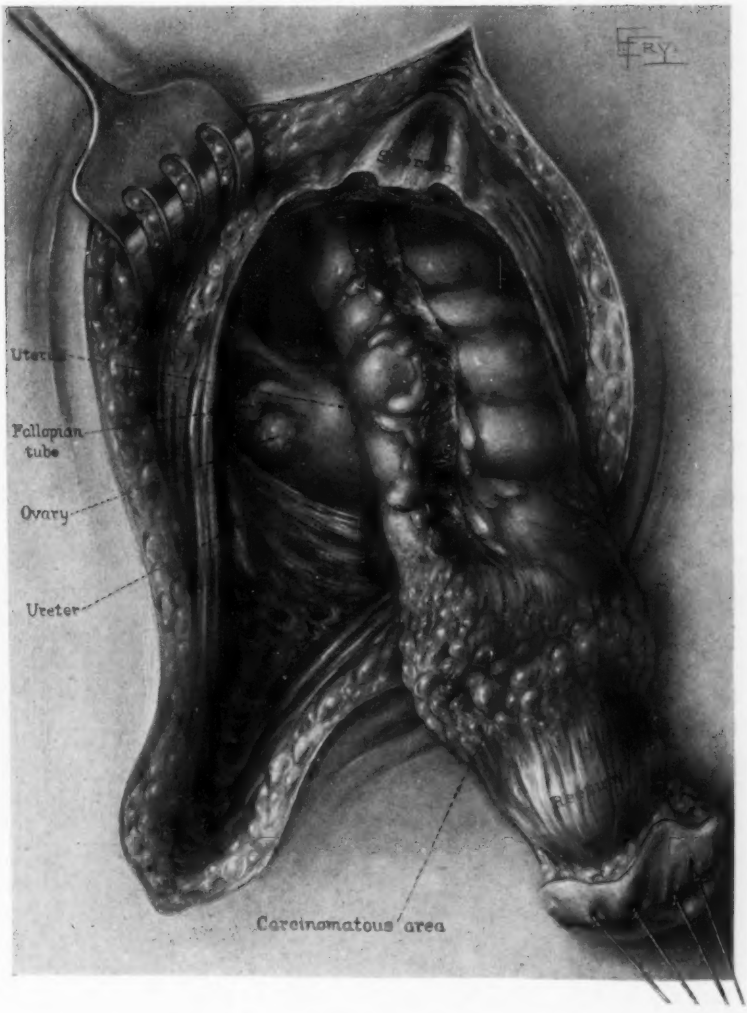
Patient in reverse Trendelenburg posture for excision of the rectum.

FIG. 2.



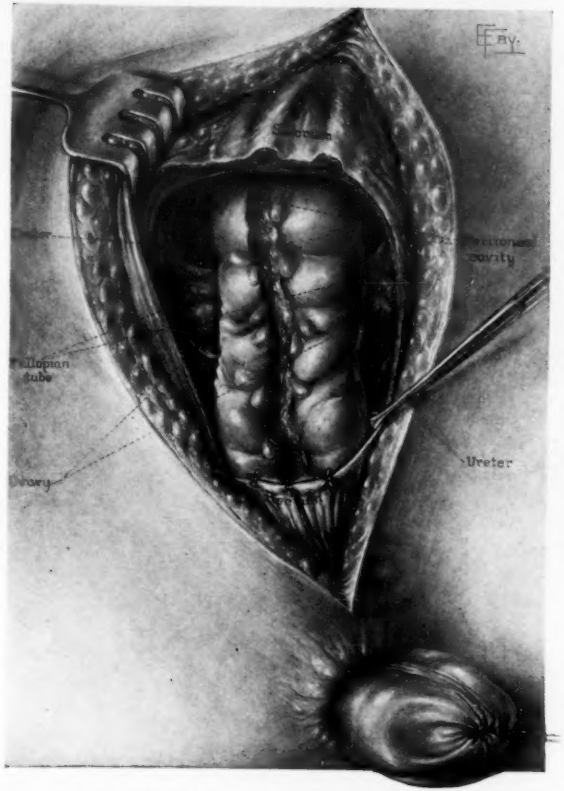
First stage of abdominosacral operation, division of lower sigmoid and permanent colostomy. Second stage, removal of entire rectum and sigmoid to point of division, from behind.

FIG. 3.



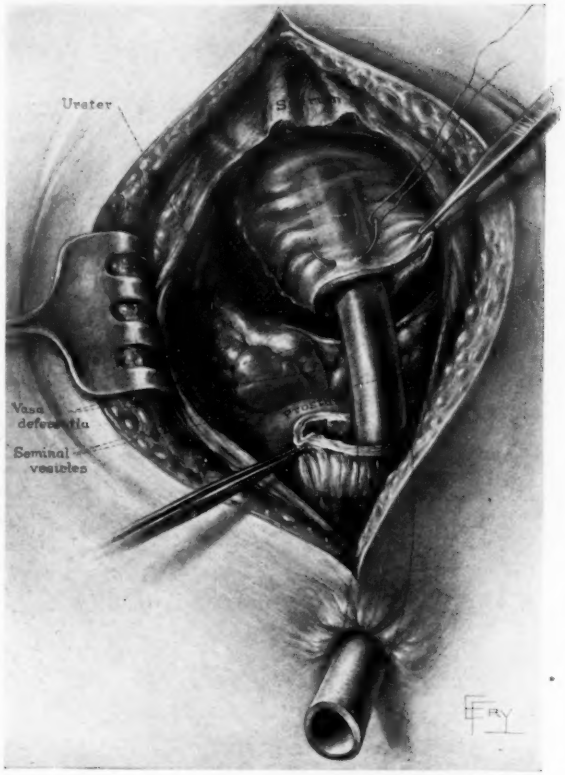
Posterior removal of rectum. Operation may be completed (*a*) by a sacral anus, (*b*) by closure of end of sigmoid if secondary to abdominal colostomy, (*c*) by removal of entire rectum and sigmoid to point of division if sigmoid be divided.

FIG 4.



Terminal muscular rectum conserved. Mucous membrane removed and end of sigmoid pulled through and out of anus. End of sigmoid left closed temporarily by a purse-string suture.

FIG. 5.



First stage of tube method of union of sigmoid to terminal muscular rectum, by posterior route. Rubber tube fastened to sigmoid by catgut suture, to be followed by directed muco-mucous suture and finally by invagination and suture.

FIG. 6.

Sagittal section showing union of sigmoid and lower rectum. Completion of tube method.

Mold

reaches from the umbilicus to the pubes. The sigmoid is drawn out and the abdominal cavity is carefully packed off with gauze. The sigmoid is clamped in two places at least six inches above the growth, firmly tied, and divided. The ends are sterilized with the actual cautery. The inferior mesenteric artery or the superior rectal, depending upon the point of division, is tied. Both ureters are identified and separated, the peritoneum rapidly divided, and the entire cavity of the sacrum quickly freed. The middle sacral artery will usually have to be tied, and the lateral sacral arteries should not be forgotten. These arteries have their origin from the posterior division of the internal iliac. The inferior pass down on the face of the sacrum and enter the lower sacral foramina. If roughly handled, unpleasant bleeding may continue from the foramina and may be difficult to check. The middle hemorrhoidals are caught and crushed in clamps. By leaving the clamps on for a few minutes, they can be removed and bleeding will seldom follow. It is easy to separate the lower sigmoid and rectum down to the levator ani muscle. The technic may then be varied. When the patients were in poor condition, we have on several occasions put an angular clamp across the lower rectum at its deepest portion, then clamped the upper side, cut between, and sterilized the cut end which projected from the deep clamp with the actual cautery. The clamps were left on the handles projecting from the abdominal incision. The rectal space was packed with iodoform gauze which was brought out with the handle of the forceps. The wrist of a rubber glove was drawn over this down as far as the peritoneum of the bottom of Douglas's pouch, which was partly closed by sutures. The proximal end of the sigmoid was brought out as a permanent colostomy through a stab wound in the left rectus muscle and attached to the peritoneum on the inside by several sutures. Three out of four cases treated in this way recovered. They were advanced cases and the operation severe. In the remainder of this group the operation was completed through the perineum, removing the rectum from below. In four the end of the sig-

moid was brought down through the anal canal, which was stripped of its mucous membrane. In two, anastomosis of the rectosigmoid was done by the tube method [11] (Figs. 4, 5, and 6), which we have found useful for carcinoma of the sigmoid higher up. In one of these two, a patient with marked obstruction, a preliminary lateral (iliac) colostomy was made and a week later the rectosigmoid was removed through the abdomen and anastomosed by the tube method. The preliminary colostomy enabled cleansing of the lower fragment and diverted the fæces until the rectosigmoid union was complete. The proximity of the colostomy was less embarrassing than might be expected at the second operation. The patient recovered. This method has merit where the true rectum is intact, and had we practised it in some of the cases that resulted fatally, I believe they might have been saved. In the remaining cases a permanent colostomy was done, the peritoneum being closed across the bottom of the pelvis as well as possible after packing the cavity with iodoform gauze, and bringing the ends out through the perineal incision.

(*b*) *Preliminary Colostomy with Secondary Posterior Resection.*—Thirty operations with four deaths (13 per cent.). There were a number of cases in this group in which acute, subacute, or chronic obstruction existed, and the majority, because of adipose tissue, cardiovascular changes, nephritis, etc., were poor surgical risks.

OPERATION.

First Stage.—An incision is made in the left rectus muscle and the abdomen carefully explored. A colostomy through the incision is then performed by the Lilienthal method. After union is complete, daily irrigation of the lower fragment is begun, washing both from the colostomy through the anus and from the anus upward until the lower segment is clean. The bowels are evacuated on the fifth or sixth day with castor oil.

Second Stage.—Seven to 12 days following the first

operation the entire rectum and rectosigmoid are removed from behind by the method described in *d*, Series 1 (Fig. 2). The end of the sigmoid is closed completely by suture and left as an appendage to the colostomy from which mucus can escape. This method has two commendable features: (1) the relief of the obstruction, and (2) careful preliminary cleansing of the part to be resected. The mortality was relatively low, and the prospects of permanent cure as good as in any other group of cases. The logic of results points to this method as the one of choice in the majority of cases of high rectal and rectosigmoid growths, but the last word is still to be said on this subject.

Where the growth extends high on the lower sigmoid the following variation in technic can be made: A mid-line incision is made suprapubically, the exploration completed, and the sigmoid brought up and divided between two ligatures and both ends sterilized (Fig. 3). The distal end is invaginated into the bowel with a purse-string suture, and the superior rectal artery tied. The mesosigmoid is divided above the promontory of the sacrum, the peritoneum divided on each side as far as the bottom of Douglas's pouch, and the fat and glands separated from their posterior attachments to this point only. The distal end of the sigmoid with the attached fat and glands is depressed and the peritoneum closed down and over the top of the mass. The anterior peritoneal attachments to the bladder and the lateral attachments of the rectum and lower sigmoid are not disturbed because the main blood supply through the superior rectal vessel has already been cut off. The end of the proximal sigmoid is brought out through the middle of the left rectus muscle as a permanent colostomy. A tube must be inserted into the lower fragment through the natural anus to carry off the discharges and to enable cleansing by gentle irrigation. On the fifth or sixth day the bowels are thoroughly emptied by means of castor oil. On the sixth or seventh day a complete posterior resection is made, and the entire fragment from the anus to the point of previous section of the sigmoid is removed from behind as

described in *d*, Series 1. The patient should be kept on the side after the sacral operation, and not on the back. This is an excellent method but has an increased mortality over the method just described. It should not be practised in the very obese, nor in those with obstruction. We had one patient die several days following the colostomy from perforation of the lower fragment. We had no deaths from preliminary colostomy as usually performed.

In several instances the patient objected so seriously to a permanent colostomy that a lateral colostomy was made at the first operation sufficiently high on the sigmoid to permit later manipulation. At a second operation the end of the bowel was drawn down through the anal canal, which must always be stripped of its mucous membrane, and, after union was complete, the colostomy was closed. Since this second variation in technic depends on conditions which cannot be known until the abdomen is opened, consent must be obtained to make a permanent colostomy if essential. This method promises most for the future, as it gives the best prospect of a complete restoration of the continuity of the alimentary canal and rectal function with a small risk.

We are encouraged in contrasting the histories of these 71 cases with those of the 120 cases previously reported. While no one operation can be applied to all cases, and while more or less incomplete operations are sometimes found necessary because of the condition of the patient, the last two years have witnessed wider extirpation and more extensive operations generally. These now include an important group of cases heretofore considered hopeless. The two most important factors in these results are, first, elimination by means of preliminary abdominal exploration of cases of abdominal metastasis which would otherwise be subjected to unavailing and dangerous operations, and second, the acceptance of permanent colostomy, sacral or abdominal, as a necessary evil in the majority of cases.

In the 120 cases previously reported, the mortality was 16 per cent. In the present group of 71 cases the mortality

is about the same (15.5 per cent.), due to the acceptance for operation of cases which previously would have been considered hopeless.

In contrasting the various methods of operation, it can be seen that the operations grouped under Series 1 give the smallest mortality. In the elderly, in the very obese patient, and in poor surgical risks, operations in one stage through the perineum or posteriorly (sacral) should be practised. The sacral operation, either as a primary operation or as the second stage of the abdominosacral method, is the operation of choice for the actual removal of the rectum. The great advantage of this particular operation lies in the fact that the disease can be extirpated widely at a single operation if necessary. In over half of the 191 cases in our combined series, this type of operation was performed as a primary operation or as the second stage of the abdominosacral method.

The abdominoperineal combined method performed at a single operation is perhaps the ideal method. In the 14 cases of this type herein reported, there were five deaths. Miles [12] lost 17 out of 42 cases, Wallis [13] gives a mortality of 40 per cent., and Hartmann [14] lost one out of four cases, and Kraske [15] four out of 10 cases. I am confident that were this method applied to all cases the mortality would be reduced one-half. It must be taken into consideration that the 14 cases subjected to operation in this series could not be done in any other way and were otherwise hopeless. The upper rectum and lower sigmoid were involved nearly to the promontory of the sacrum. In all a complete dissection of both ureters was necessary. Four of them had been operated previously and a colostomy made because they were considered hopeless. In two, a loop of adherent small bowel was coincidently resected, and in two cases the uterus was involved and removed. Are operations justifiable in carcinoma advanced to this degree? Our experience leads us to believe that they are—we have a number of five-year cures in the 26 cases of abdominal and abdomino-combined operations in one stage in the previous series of 120 cases reported in 1910.

The combined abdominosacral operation in two stages has much to commend it and has a mortality of less than one-half that of the abdominoperineal combined operation in one stage. The ability to cleanse the lower fragment, and the relief of obstruction which a preliminary colostomy makes possible is of the greatest importance. This method also permits the removal of tumors of the most extensive description from the rectum proper, a situation in which the abdominoperineal combined operation affords insufficient access. The rectum can be dissected by the sacral route with as much precision as in the cadaver, and it is a suitable procedure for practically all growths of the rectum and rectosigmoid. Its greatest advantage lies in the fact that if a temporary colostomy be made to divert the fecal current until satisfactory union of the upper and lower fragments has taken place, in suitable cases complete restoration of normal function can be confidently expected.

We are to-day operating upon cases which three years ago we would have considered entirely beyond the reach of surgery because experience has shown that cancer of the rectum long remains a local disease, and by block dissection cure can be obtained in a goodly percentage of cases.

RESECTION OF THE RECTUM AND RECTOSIGMOID.

January 1, 1910, to April 1, 1912.

Total number	71
Discharged	60
Died	11 (15.5 per cent.)

POSTERIOR AND PERINEAL OPERATIONS.

	No. cases	Discharged	Died	Mortality Per cent.
Local operation	2	2	0	0
Harrison-Cripps	5	5	0	0
Quenu-Tuttle	12	11	1	8⅓
Posterior (Kraske)	8	7	1	12.5
	27	25	2	7

ABDOMINAL OR ABDOMINAL COMBINED IN ONE OR TWO STAGES.

	No. cases	Discharged	Died	Mortality Per cent.
Abdominal and abdominoperineal: single stage	14	9	5	35
Preliminary colostomy with secondary posterior operation in 2 stages	30	26	4	13
Total	44	35	9	20

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NEPHRECTOMY.

A STUDY BASED ON THE RECORDS OF 112 CASES.

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(Concluded from page 54)

TUBERCULOSIS.

Statistics.

	Cases.	Deaths.	Percentage of Mortality.
Primary nephrectomy	7	4	23.5
Secondary nephrectomy	3	0	0
Total percentage of mortality.....			20

Four times nephrectomy was subcapsular, followed by no death. Altogether, ureterectomy was done seven times, six times as a primary, once as a secondary procedure.

Out of 20 instances of tuberculosis of the kidney, the specific bacillus was encountered in the urine only six times; 14 times it was absent, though either pyuria or hæmaturia, or both, were present. Among these 14 cases Koch's bacillus was found twice in the puncture fluid withdrawn from the fluctuating kidney tumor. Thus it appears that only eight times was the diagnosis incontestably positive. Ten times, though no tubercle bacilli could be demonstrated, the proper diagnosis was nevertheless made with fair probability. It was based on a tuberculous family history, on the presence of hæmaturia with a fluctuating tumor, on pulmonary signs of the malady, on stigmata of Pott's or other joint disease, but especially and in most instances on the presence of typical ulcers of the bladder. The Calmette and Von Pirquet tests gave additional aid. Twice only were all the signs generally justifying suspicion of tuberculosis entirely absent. Primary nephrectomy was done altogether 18 times, twice by the sub-

capsular method, and six times in conjunction with ureterectomy. In one only of these ureterectomies a second incision, one parallel to and above Poupart's ligament, had to be employed. In one case secondary ureterectomy became necessary. Secondary nephrectomy was done twice, not as a matter of choice but as a necessity; once because the patient's strength failed to an alarming degree very soon after the beginning of the operation, although a preparatory intravenous saline infusion had preceded it. In a second case there was also collapse, following a moderate arterial hemorrhage due to the giving way to finger pressure of a septum dividing two abscesses. The bleeding vessel was caught by a clamp, which was left *in situ* for three days. On the fourth day nephrectomy was done, when the brittle tissues of the pedicle were promptly cut through by the elastic ligature. By a lucky pass the retracted stump was caught and was secured by two silk ligatures applied with an aneurism needle.

As suppuration was present in almost every instance, careful watch was kept for injuries of the peritoneum, so as to guard against unobserved infection of the peritoneal cavity. Several times the peritoneum was purposely opened for the sake of exploration. Before proceeding to the delivery of the kidney, peritoneal rents or incisions were carefully sutured and protected with gauze packings. After removal of the kidney the wound was always immediately united up to the vent left for the exit of drainage except once. In this exceptional case necessary haste compelled us to pack the wound for the time being, and to close it later by secondary suture.

Out of the total number of 20 patients four died, all after primary nephrectomy. The causes of death were: suppression of urine, diphtheria of the bladder, general miliary tuberculosis, and acute anæmia due to loss of blood.

Case LXIII.—*Tuberculosis of bladder, ureter and left kidney. Epicystotomy. Nephrectomy. Ureterectomy. Cure.* (*Hospital Reports,* 1901, p. 195.)

Harry S., age thirty-eight, admitted October 25, 1898. Family

history negative. Two years ago hæmaturia with vesical pain radiating to penis. Shortly afterward another attack of hæmaturia, followed for three months by frequent, painful urination, with tenesmus. Kept in bed for three months. Urine became and remained turbid. Lost much flesh and strength. On admission, fairly well nourished; rough breathing over both lungs. Temperature, pulse, and rate of respiration normal. Left loin sensitive to pressure. Urine clear, acid, 1022, albumin, pus, tubercle bacilli. October 29, cystoscopy. Trabeculated bladder; a bleeding, elevated ulcer in trigonum, which prevented ureteral catheterization. November 1, suprapubic cystotomy under chloroform. Ureteral catheterization; no urine from left side; that from right ureter showed no tubercle bacilli. Closure of suprapubic wound, which healed promptly. December 5, typical nephrectomy, individual ligature of vessels. January 20, no bacilli in urine. February 6, had gained seven and one-half pounds. May 2, ureterectomy down to within an inch of the bladder. June 12, still some vesical tenesmus; urine clear, acid, containing a few pus-cells. Discharged cured.

CASE LXIV.—*Tubercular pyelonephritis. Suppression of urine. Death.* (*Hospital Reports,* 1901, p. 198.)

Fanny L., age thirty-six, admitted June 13. Twelve months ago patient became pregnant. In the fifth month of gestation pain in left loin. Was delivered of a healthy child three months ago. Puerperium normal. As soon as out of bed, began to have former kind of pain. It begins in loin and radiates down toward left iliac region. Six weeks ago patient noticed turbid urine. Micturition frequent and painful. Examination showed a pale, poorly nourished woman. Occupying the left loin, a hard, movable mass. Slight œdema of the legs. Temperature 100°, pulse 110, respiration 24. Urine light colored, acid, 1006, albumin, many pus-cells. Urea 0.5 grain to the ounce. June 18, temperature 103°, pulse 110. Harris segregator introduced; cloudy, bloody urine from left side; purulent urine from the right. June 20, temperature 103.4°, pulse 108. Nephrectomy through oblique incision. Kidney much enlarged. Was aspirated, no pus found. Upon stripping off the capsule, a far advanced tuberculosis was seen; nephrectomy. Elastic ligature. Stimulating enemata given. June 21, temperature normal, pulse 100 to 112, respiration 26 to 32. Passed seven ounces of urine, half of which

was pus; vomited frequently. It was feared that the remaining kidney was failing. June 22, temperature 98.6°, pulse 108 to 125, respiration 24 to 32. Passed only one ounce of urine with much pus. June 23, pulse weak; infused a pint of salt solution. Only one-half ounce of urine secreted. June 25, passed one ounce of urine; pulse 120, full and strong. By phlebotomy four ounces of blood were withdrawn and one pint of saline solution infused. June 27, patient died at 4.30 A.M. No autopsy permitted.

CASE LXV.—*Multiple fibromata of right kidney (healed, or latent tuberculosis?). Nephrectomy. Cure.* (*Hospital Records,* 1901, p. 329.)

Edward P. S., fifty years old, merchant, admitted May 2, 1900. No tuberculosis in the family, pneumonia twelve years ago, had no gonorrhœa. Four years ago painful and very frequent micturition, lasting for several days, and recurring about every four months. In November, 1899, an especially severe attack compelling patient to remain in bed. Had then several severe chills, with high fever, acute pain in the right loin, very painful, scalding urination, and for two weeks passed bloody, dusky urine. Pain radiated from right loin into glans penis and rectum. A free interval of two weeks was followed by another attack, lasting again about two weeks. After this was examined by Dr. Swinburne at New York, who found abundant tubercle bacilli in the urine. Cystoscoped by Dr. Alexander, who found a normal bladder, and gained, by catheterization, a quantity of absolutely normal urine from the left ureter. Right ureter could not be entered; to its vicinity a plug of purulent looking mucus was found attached. The fluid in the bladder became so obscured that cystoscopy had to be discontinued. Cystoscopy was followed by a smart attack of orchitis, which ended two weeks after examination by the spontaneous discharge of a scrotal abscess. During hæmaturia, marked loss of weight; but in last three months the loss was recovered. On admission patient still complained of frequent urination and pain at end of penis, but lumbar pain had disappeared. Pulse, temperature, and respiration normal; fairly good condition. Thoracic and abdominal organs normal. Urine clear, acid, specific gravity, 1015, traces of albumin, no sugar; but pus-cells and bacteria. Daily search for tubercle bacilli negative. Patient suffered from intense dread of renal tuberculosis, and urged exploration, to which consent

was finally given. May 7, under chloroform, right kidney exposed and developed. Size and appearance normal. Vessels having been isolated and compressed, kidney was bisected. Glandular portions and calices normal, except that in cut surfaces of cortex four hard, whitish-yellow nodules, the size of a hempseed, were found, closely resembling miliary tubercle. No scars in calices or the pelvis. Vessels separately tied and severed; then ureter was isolated down to level of pubic bone, tied, and cut off. Healing of the wound rapid. Urine passed by urethra contained, for a few days, traces of albumin and some hyaline and granular casts, but was abundant, and patient was discharged cured on May 23.

Very careful examination of kidney revealed chronic interstitial nephritis with adenomatous changes of the parenchyma. The nodules noted at the operation, of which more were found in various sections, proved to be fibrous tissue, evidently the vestiges of a process that had reached its termination. Nothing characteristic of tubercle and no bacilli were found. Unfortunately the specimen had been placed in alcohol immediately after its removal, and no inoculation experiments could be made. The question, whether nephritis had originally been suppurative or tuberculous, had to remain undetermined.

CASE LXVI.—*Tuberculosis of right kidney. Nephrectomy. Cure.* (*Hospital Reports,* 1901, p. 342.)

Morris N., tailor, age thirty-six. Admitted June 6, 1900. Gonorrhœa 15, smallpox 13 years ago. Since two years frequent and painful urination, the act ending with escape of a little blood. No hæmaturia; passed water hourly during the night. Since five weeks urine turbid and foul. A dull, constant pain in right loin, much aggravated by exertion. No chills or fever. On admission, excellent general condition, muscular frame. Internal organs normal. In right loin a tender, hard body felt. Pulse, temperature, and respiration normal. Urine very turbid, with pus and tinged with blood, acid, albumin, no tubercle bacilli. June 8, nephrectomy, chloroform. Reflection of peritoneum identified, then injured, but immediately closed. Kidney small, several fluctuating areas; puncture gave pus. The situation very high, immobility pointing to very short pedicle. Subcapsular elastic ligature. Absence of parenchyma, four abscesses, swarming with tubercle bacilli; lining of cavities ne-

crosed. June 17, urine normal. July 10, ligature came away. August 11, discharged cured.

CASE LXVII.—*Tubercular pyonephrosis of right side. Nephrectomy, secondary ureterectomy. Cure.* (*Hospital Reports*, 1903, p. 164.)

Hyman G., tailor, thirty-nine years old. Five months ago was suddenly taken with severe chill, fever, vomiting, and suppression of urine, accompanied by pain in right side. Was jaundiced for two months. Feet have tendency to swell. During the past three months noticed increasing weakness and puffiness of feet. Had lost twenty-five pounds in weight. Noticed continuous pain in right side; urination painless.

On admission, December 3, 1900, lungs: retraction above both clavicles, dulness and râles over both apices. Heart normal. Liver slightly enlarged. Spleen normal. Slight kyphosis corresponding to eleventh dorsal vertebra. Right side of abdomen visibly bulging. Corresponding to this in the right hypochondrium, a large globular mass, reaching the median line, which can be bimanually manipulated. Colon can be felt and percussed passing over its lower pole. Tumor shows indistinct fluctuation. December 10, cystoscopy. Trabecular bladder; mucosa normal; left ureteral orifice normal; right ureteral orifice normal except for a surrounding capillary injection. Aspiration of tumor through loin yielded abundant seropus. Pulse 60–72, temperature normal or slightly elevated. Examination of aspirated fluid showed it to contain trace of albumin, pus, red blood-cells, and abundant tubercle bacilli. Urine, trace of albumin, no casts. December 14, nephrectomy. After free stimulation, oblique lumbar incision, exposure of peritoneal reflection, and development of the large, fluctuating tumor. This was much facilitated by evacuating several discrete abscess cavities. Tumor a large pus sac, renal elements absent. Renal vessels individually tied with catgut and divided. Thickened ureter exposed for the distance of about seven inches, divided, and distal stump tied with catgut. As the wound had been soiled by pus, a Mikulicz tampon was applied and the anterior angle was closed with button sutures. Intravenous saline infusion of 1000 cc.; pronounced chill, probably due to infusion. Slight febrile reaction. During the first three days passed between 15 and 20 ounces of urine daily. December 21, patient coughing. Tubercle bacilli found in sputa.

January 5, 1901, patient out of bed. Wound contracting. February 12, 1901, discharged with moderately secreting sinus. April 10, 1901, readmitted with persistent sinus and pain in right inguinal region; urination frequent and painful. Urine clear, no tubercle bacilli. Local treatment being unsuccessful, June 3, ureterectomy; excision of scar and extension of incision to Poupart's ligament. Detachment of ureter to within one-half inch of bladder, where it was tied and cut off. July 21, dis charged cured, with urination painless though still somewhat frequent.

CASE LXVIII.—*Tuberculosis of left kidney. Nephrectomy. Cure.* (*Hospital Reports,* 1903, p. 258.)

Henry B., clerk, of Savannah, Ga. Family history tuberculous. Had suffered for six years from attacks of pain in left lumbar region, at times radiating downward into bladder and thigh. Urine was dark brown, malodorous, and cloudy, never bloody. Passed gravel four months before admission. Had lost weight. On admission, April 19, 1902, internal organs normal. Left loin tender and painful; no tumor. Urine acid, 1024; faint trace of albumin; few pus-cells; mucus; no tubercle bacilli on repeated examination; total amount of urine 35 to 40 ounces; urea, 2 per cent. April 21, 1902, exploration of left kidney under gas and ether. Development of the organ difficult on account of numerous adhesions, especially around upper pole. Kidney enlarged, lobulated; at its upper pole a fluctuating area which contained pus. Ureter much dilated. Nephrectomy. Vessels of pedicle separately tied. Ureter was stripped out of its bed as far as its pelvic portion, and then ligated and removed. Specimen: Large abscess at upper pole; several small cheesy foci in its vicinity. Ureter thickened, dilated, and constricted near its pelvic portion. Tubercle bacilli in pus. Uneventful convalescence. Discharged cured May 17, 1902.

CASE LXIX.—*Intermittent hydronephrosis of right side from kinking of ureter, lysorthosis; liberation and straightening out of ureter; improvement. Tuberculosis of hydronephrotic kidney. Nephrectomy. Cure.* (*Hospital Reports,* 1905, p. 171.)

Sophie S., age twenty-one, admitted December 30, 1903. Had been operated upon two years before for floating kidney. Had been entirely well until six months ago, when attacks of pain with scanty urine, set in; after cessation of each attack urine be-

came very abundant. Micturition frequent, urine clear, no cough. On admission, general condition fair, internal organs normal. During an attack at hospital, tumor was observed in right loin. By ureteral catheterization, right kidney, urine clear, acid, a few pus-cells, no tubercle bacilli, urea 0.9 per cent.; left kidney: clear, acid, a few red blood-cells and pus-cells; urea 0.7 per cent. January 1, 1904, under ether: upper segment of ureter found much dilated, tortuous and fixed by adhesions; renal pelvis dilated. Liberation of ureter from adhesions. Cessation of attacks and disappearance of tumor. February 9, discharged. February 23, readmitted, as constant lumbar pain, chills and fever, vomiting and frequent urination had set in after discharge. Lumbar tumor reappeared, very tender. Temperature 104.2° F., pulse 140, leucocytes 28,000. March 5, tubercle bacilli in urine. March 14, nephrectomy. Large abscess in upper pole. April 19, discharged cured.

CASE LXX.—*Tuberculosis of right kidney and ureter. Nephrectomy and ureterectomy. Death.* (*Hospital Records,* 1904–1905, iii, p. 499.)

Rachel F., age twenty-three, admitted February 28, 1905. Brother died of tuberculosis. Eighteen months ago hæmaturia, since then strangury and frequent bloody urine. Dulness of apices. In right loin a large tumor, extending to median line of abdomen and three fingers below umbilicus. Temperature and pulse normal. March 11, 1905, typical nephrectomy. Ureter stripped down and ablated close to bladder. Specimen: kidney 5½ inches long, 3½ inches thick and wide; pelvis distended by turbid serum, studded with miliary tubercles. Parenchyma much thickened and peppered with miliary tubercles. Ureter thickened and dilated. March 12, temperature 105° F. No pain; urine 41 ounces. March 17, continued high fever. Patient stated invariably that she felt well. Urine 50 ounces, clear. March 21, died. Autopsy: diphtheria of bladder.

CASE LXXI.—*Tuberculosis of right kidney. Explorative nephrotomy of left kidney. Nephrectomy of right kidney. Prolonged suppuration. Incision of perineal abscess. Improvement.* (*Hospital Records,* 1906–1907, vii, p. 833.)

Isidor L., age thirty-eight, tailor, Russian. Admitted July 24, 1906. Since three years terminal pain at micturition, frequent nocturnal voiding. Condition much aggravated during past four

months, since when urine has become very turbid and bloody at end of voiding. On admission, no signs of pulmonary tuberculosis. Pulse and temperature normal. Urine loaded with pus and red blood-cells. No tubercle bacilli. In the right loin a small, very tender hard mass could just be made out. Right kidney not palpable. Cystoscopy: congestion of trigonum; right ureteral opening closed by blood-clot. July 30, explorative nephrotomy of left side, with negative result. August 31, nephrectomy of right kidney, which was found the seat of miliary tubercles and contained a number of small abscesses. No stones. Individual ligature of vessels. Convalescence retarded by the formation of several abscesses in both wounds and in the perineum, all of which were drained. December 26, discharged much improved, with clear urine but frequent urination.

CASE LXXII.—*Tuberculosis of right kidney. Nephrectomy and ureterectomy. Exploratory cystotomy. Secondary cystorrhaphy. Improvement.* (*Hospital Records,* 1906–1907, vii, p. 839.)

Justine R., age forty-three, housewife, Hungarian. Admitted January 14, 1907. Father died of tuberculosis. Three months ago acute pain in right loin, with chill and vomiting, followed by frequent and painful urination. Pain radiating to bladder. On admission, fairly well nourished, heart and lungs normal. In right loin a smooth, movable, and painful tumor of the size of an orange. Cystoscopy. Base of bladder intensely congested, hemorrhagic spots in trigonum. Orifice of right ureter œdematous, congested. Urine from this side: much pus, blood. Catheter met with obstruction 3 cm. up. Left side, urine normal. Radiographic plate showed shadow in right ureter corresponding to obstruction. January 22, nephrectomy, cystotomy, exploration of right ureter. Easy delivery of kidney, in which several abscesses were recognized. Individual ligation of vessels. Ureter was exposed down to the bladder, no stone could be felt. Cystotomy. Ureteral aperture divulged and ureter explored. No stone found. Suture of bladder. Ureter excised. Kidney was peppered with miliary tubercle and contained several abscesses, one containing one ounce of grumous pus. Permanent catheter in bladder. Convalescence much delayed by prolonged burrowing suppuration around the stump of kidney, and by a late breakdown of the healed bladder scar, needing secondary cystor-

rhaphy. October 9, discharged with closed lumbar wound, that of the bladder showing occasional minute leakage. General condition excellent. Urination still frequent, but not painful.

CASE LXXIII.—*Tuberculosis of right kidney. Nephrectomy. Cure.* (*Hospital Records,* 1907–1908, viii, p. 951.)

Valeria H., age thirty-five, housewife, German. Admitted February 10, 1908. Operated on eleven years ago for appendicitis. Three months ago began to feel burning pain in vulva before and after voiding, with increased frequency of urination, and noticed sharp, intermittent pain in right loin. Has been in bed three months. In January operation for cysto-retrocele in gynæcological department, from which she was transferred to us. On admission, no pulmonary signs; positive Calmette. In right loin a large, tender, movable mass. Temperature 99° F., pulse 84. Cystoscopy. Multiple ulcers of bladder mucosa in trigone. Urine: right side, very turbid, alkaline, loaded with pus, no tubercle bacilli; left side, alkaline, trace of albumin, no pus, red blood-corpuscles. Combined urine, cloudy, acid, 1024, much pus, few red blood-corpuscles. Radiograph, faint shadow in right kidney. February 13, nephrectomy. Vessels tied separately. Ureter much congested and brittle. Pathological report of specimen, tuberculosis of kidney. April 1, discharged cured.

CASE LXXIV.—*Tuberculosis of left kidney. Nephrectomy. Ureterectomy. Cure.* (*Hospital Records,* 1907–1908, viii, p. 953.)

Frida F., age twenty-two, clerk, Russian. Admitted April 29, 1908. Since four months, frequent and painful urination, fever and chilliness at night. Night sweats. Dry cough; loss of flesh and strength. On admission, long, flat chest, distinct retractions at apices, with dulness on percussion; no tubercle bacilli in sputa. In left loin a distinct tender mass. Temperature 104° F., pulse 120. Cystoscopy report, lost. Urine clear, acid, 1010, much pus. April 30, nephrectomy. Kidney much enlarged. In upper pole a large abscess, its evacuation facilitated delivery. Ureter much thickened; was severed. Elastic ligature and ablation. Ureter stripped off the peritoneum for six inches. Second incision parallel to Poupart's ligament and retroperitoneal exposure of lower part of ureter. Isolation and ablation near bladder. A dense band of connective tissue tied down ureter at crossing with

external iliac. Specimen: kidney twice the size of the normal, studded with numerous miliary tubercles. Abscess cavity in upper pole lined with cheesy, necrotic material. Ureter much thickened and dilated. Ligature came away on thirty-sixth day. Uneventful recovery. June 7, discharged cured, with much improved general condition. Urination painless, six times in 24 hours. Urine clear, acid, still containing a few white blood-corpuscles.

CASE LXXV.—*Tuberculosis of right kidney, ureter and bladder. Nephrectomy and ureterectomy. Death from general miliary tuberculosis.* (*Hospital Records,* 1907–1908, viii, p. 955.)

Chawe B., age twenty-eight, housewife, Russian. Admitted November 13, 1907. No pulmonary history. One year ago began to get paroxysmal attacks of pain in both loins, oftener and more severe on right side. Frequent and painful voiding. Since eight months turbid urine, with constant suprapubic pain. Four months ago suprapubic cystotomy in a Brooklyn hospital. Wound healed in three months, but reopened. Chills and fever set in after this operation. Cough and profuse expectoration since one month. On admission, emaciated; narrow chest; retraction above clavicles; no gross signs of lung trouble except bronchitis. Left kidney non-palpable. In right loin distinct, tender, moderately movable mass. Suprapubic urinary fistula. Cystoscopy. Intense cystitis, ureteral orifices could not be found. Temperature 102° F.; pulse 120, weak. Urine amber, turbid, acid, 1016, loaded with pus. Hyaline and granular casts. The radiograph shows a small stone in left kidney. November 19, nephrectomy of right side. Elastic ligature inside of fibrous capsule. Specimen: large kidney with thinned cortex and filled with foul pus. Several discrete cortical abscesses. Ligature came away on eighteenth day. Wound healed except in lower angle, where probe entered ureter and could be pushed into bladder. Bladder still very irritable, but general condition had improved with lowering of temperature. Suprapubic fistula still discharging. May 5, ureterectomy. Loosening of upper end of ureter, then, by iliac incision, retroperitoneal exposure of lower end of ureter, and excision at crossing with uterine artery. May 15, increased pulmonary trouble, cavities can be demonstrated. Laryngeal tuberculosis. Continued hectic fever. July 4, died of exhaustion.

Post Mortem.—Miliary tuberculosis of left lung. Right lung, miliary tuberculosis and several somewhat large cavities lined

with necrotic material. Laryngeal tuberculosis. Left kidney enlarged, miliary tuberculosis; in cortex a number of abscesses, some communicating with pelvis, which contained a small stone. Bladder, mucosa studded with innumerable miliary tubercles; no ulcers. At ileocæcal valve large circular ulcer.

CASE LXXVI.—*Tuberculosis of left kidney. Nephrectomy. Cure.* (*Hospital Records,* 1910–1911, ii, p. 1296.)

Rosie G., age thirty-seven, button-hole worker. Austrian. Admitted June 29, 1911. Had pneumonia and pleurisy six months ago; since then has not recovered health. Since three months swelling of legs, night sweats, and frequency of urination. On admission, systolic murmur over apex, and accentuated second pulmonary sound. In left loin a large, hard, immovable and tender tumor. Temperature 99°, pulse 100. Urine, pale amber, cloudy, alkaline, 1008, albumin, no sugar, pus, a few red blood-corpuscles. July 20, extracapsular nephrectomy. Individual ligature of vessels. Pathological report, tuberculosis. Uneventful recovery. Discharged cured, August 6, 1911.

CASE LXXVII.—*Tuberculosis of left kidney. Nephrectomy. Cure.* (*Hospital Records,* 1910–1911, p. 1300.)

Boleslaw B., age thirty-eight, hatter, Russian. Admitted October 25, 1911. Four years ago affection of right lung with cough, fever, and night sweats, which trouble lasted one year. Two and a half years ago onset of paroxysmal attacks of pain in left loin, radiating to genitals. Urine bloody off and on. Fever and chills, and emaciation. On admission, temperature 100° F., pulse 80. Urine amber, cloudy, acid, tubercle bacilli present. Lungs normal. In left loin, a tender, fixed mass the size of a small fist. Cystoscopy: Catheterization of right ureter. Urea 2 per cent. Left ureter not catheterized. Radiograph negative. October 30, 1911, extracapsular nephrectomy. Individual ligature of vessels. Specimen: organ moderately enlarged. A large tuberculous focus in lower pole, which had not perforated into calix of pelvis. Uneventful recovery. Discharged cured, November 15, 1911.

CASE LXXVIII.—*Tubercular pyonephrosis. Nephrotomy. Nephrectomy. Cure.* (*Hospital Reports,* 1903, p. 161.)

Mary H., age twenty-four, music teacher, single. When nine years old suffered from "spinal trouble," for which she wore jury mast during six months. Preceding this had a discharging

ear. No cough, no night sweats. Three years ago commenced to complain of frequent and painful urination. Had to empty bladder every two hours. Eighteen months ago blood appeared in urine; sometimes it was fresh, at other times clotted. A physician cystoscoped her, and found an ulcer of the bladder. A week ago noticed dull pain in right lumbar region, radiating to shoulder-blade, then had severe attack of renal colic. On admission, December 6, fair condition. Heart, lungs, liver, and spleen normal. In right hypochondrium a large mass, slightly movable, tender to touch; no respiratory movement. Temperature and pulse normal. Urine acid, 1024, 1 per cent. of albumin (Esbach), with sediment of half an inch of pure pus in the test tube; urea 2.2 per cent. Amount of urine, 45 ounces. Urinated every hour. December 8, cystoscopy. Bladder trabeculated; mucosa normal, except in trigonum, where it was intensely congested. During inspection a jet of clear urine was emitted by left ureter. In spite of deep anæsthesia bladder intolerant, holding 3 ounces with difficulty. December 10, nephrotomy, ether. On account of the poor pulse, intravenous saline infusion of 1000 c.c. Aspiration withdrew pus. Reflection of peritoneum was incised, and the hand was passed in to ascertain presence of the left kidney, which was found normal in size and consistence. Peritoneum closed. Kidney showed two fluctuating areas; these were incised and grumous contents evacuated. Patient's condition beginning to fail, kidney was replaced and outer wound packed; nephrectomy postponed to another occasion. Operation followed by severe chill, which might have been due to saline infusion. Irritability of bladder markedly diminished. Discharge from kidney continuing profuse, nephrectomy was done December 31. Development of kidney easy; pedicle secured by rubber ligature. January 3, 1901, urine clear, acid, of sufficient quantity. January 18, patient out of bed. January 20, ligature came away. Irritability of bladder much improved. February 8, discharged cured.

CASE LXXIX.—*Tubercular pyonephrosis. Nephrotomy. Nephrectomy. Cure.* (*Hospital Reports,* 1903, p. 163.)

Jacob E., tailor. Eight months ago had "attack of gravel," with pain in groin and penis; turbid urine; no hæmaturia. For past four months constant abdominal pain of varying severity; attacks more severe at night. Had lost 30 pounds. On

admission, April 18, condition poor and anæmic; temperature 102.6°. Retraction above and below both clavicles. Crepitant râles in both lungs. Heart, liver, and spleen normal. Right rectus rigid. A small reducible ventral hernia one and one-half inches below xyphoid. Bimanual palpation of right hypochondrium and loin painful, and on account of muscular rigidity unsatisfactory. Rectal palpation showed hard, painless nodule occupying median portion of prostate. Urine cloudy, acid, 1022; traces of albumin; copious sediment containing only pus-cells; daily amount, above 30 ounces. April 22, examination under chloroform. Large, nodular mass in right flank, colon displaced forward. Puncture yielded pus. Cystoscopy. Right ureteral orifice dusky and congested; left ureteral orifice normal. April 26, nephrotomy and drainage; ether. Kidney was opened along convexity; a system of abscess cavities evacuated. Intervening septa were broken down; one of these bled profusely; as brittle parenchyma would not hold a ligature, clamp left *in situ;* drainage, wound partly closed and dressed. Considerable post-operative reaction, temperature rising to 104° F. April 27, profuse discharge of bloody serum. April 29, clamp removed, packings changed. Discharge gradually became purulent, and continued very profuse. May 27, nephrectomy. Incision in old scar. Granulating sinus excised down to kidney. Difficult isolation and development of shrunken kidney, during which a number of small abscesses were ruptured. While applying elastic ligature to pedicle, the latter was torn. By a lucky pass retracted pedicle secured, clamped, withdrawn, and tied with double silk ligature passed with Deschamps needle. May 28, moderate febrile reaction. Ligatures cast off July 11. July 28, discharged cured. Urine clear.

Case LXXX.—*Tuberculosis of left kidney. Nephrotomy. Nephrectomy. Cure.* (*Hospital Records,* 1907–1908, viii, p. 952.)

Edmund P., age twenty-seven, German, machinist. Admitted December 11, 1907. Gonorrhœa six years ago. Three years ago burning pain on frequent voiding. Six months ago pain with noticeable swelling was felt in left loin; urine became turbid, frequency of urination increased. During numerous attacks of colic had chills and passed bloody urine. Night sweats. Lost eight pounds of flesh. On admission, emaciated; temperature

101° F., pulse 104. Lungs negative. Kidneys non-palpable. Urine amber, turbid, acid, 1022, loaded with pus, no tubercle bacilli. December 16, temperature 105° F. Three attempts at cystoscopy failed on account of intolerance of bladder. January 13, cystoscopy in anæsthesia. Posterior bladder wall covered with ulcers, free hemorrhage frustrated catheterization of ureter. Radiography negative. The continued fever, the irritability of the bladder and the pain in right loin determined nephrotomy on January 25. Kidney imbedded in dense cicatricial mass; much enlarged; protruding fluctuating areas yielded grumous bloody detritus. Transcortical drainage of pelvis. January 26, tubercle bacilli found in discharge from drainage tube. February 6, subcapsular nephrectomy. On account of dense adhesions and shortness of pedicle, some parenchyma left adhering to stump to prevent slipping of ligature. As several abscesses had opened during the delivery and had soiled wound, this was packed and not sutured. February 15, little reaction followed operation. Urine much clearer. Secondary suture of wound. February 27, ligature came away. March 5, urine clear, amber, acid, 1016, no pus nor blood. Discharged cured, with small granulating wound.

Note.—This series contains only 18 of our 20 histories of tuberculosis of the kidney. The two other cases will be found on pages 8 and 12.

ECHINOCOCCUS.

Of the two instances of echinococcus successfully treated by nephrectomy, one presents no unusual features; the other, however, is full of surgical interest. Renal hydatids are a very rare affection; the left kidney is attacked twice as often as the right one. Calcification of the hydatid sac is of the utmost rarity. Our second case belongs to this class.

CASE LXXXI.—*Echinococcus of left kidney. Nephrectomy. Cure.* (*Hospital Records,* 1910–1911, p. 1298.)

Charles K., age forty-one, Russian, peddler. Admitted September 5, 1911. Since ten years had many attacks of "gravel," passing calculous grit with bloody urine and acute pain in left loin, bladder, and urethra. During renal attacks had fever and chills. On admission, temperature 99° F., pulse 96.

Urine amber, clear, acid, 1020. No albumin or sugar. No blood, oxalates, or urates. In left loin a large, balloting, kidney-shaped, tender mass, the size of a grape-fruit. Radiograph, no evidence of calculus. September 8, nephrectomy. Oblique incision; exposure of peritoneal reflection. Spleen could be clearly distinguished from tumor. Descending colon stripped off from anterior surface of tumor, exposure and individual ligation of vessels. Separation of a large number of adhesions between fatty and fibrous capsules. Specimen: shape of elongated gourd, one end much thicker than the other. Pelvis much distended. On section only a narrow zone of parenchyma left; renal sac and pelvis filled with many mother and daughter cysts; scanty fluid contained hooklets. Uneventful recovery. Discharged cured, October 1, 1911.

Case LXXXII.—*Echinococcus of the right kidney. Complete calcification of the entire sac. Excision of a fenestrum of the sac and evacuation of cystic contents. Secondary resection of portion of kidney and extirpation of concremental shell. Cure.* (Contribution, etc., *loc. cit.*, p. 684.) (From German Hospital, New York.)

Mrs. E. D., age twenty-six years, was presented by Dr. Steudel, of Seymour, Conn., June 19, 1895. The delicately built, small woman was pregnant in the sixth month, and stated that up to within three months she had felt entirely well, with the exception of a dull and heavy feeling which had existed in the right hypochondrium for about seven years, but had caused no serious inconvenience. Eight years ago, while serving in a place in Germany, she had regularly to feed a number of dogs. A fortnight ago was attacked by severe renal colic while voiding urine, and observed that toward the end of micturition a number of grape-like bodies passed. A collection of these bodies was shown to me. I immediately recognized them as secondary hydatids. Dr. Steudel also found a considerable tumor in the right loin. This was found to be smooth, unusually resistant, non-fluctuating, and immovable. It extended downward in the right hypochondrium to the level of the navel, but was not influenced by respiratory movements. Corresponding to the lowermost portion of the mass, a smaller, knob-like, softish projection could be felt; this was very tender on pressure. By percussion it could be ascertained that the tumor extended up-

ward posteriorly to the level of the seventh rib. Moderate nightly elevations of the temperature. On admission daily quantity of urine was 1430 grammes. It contained neither albumin, pus, nor sugar. All other organs were normal. On June 21, under chloroform anæsthesia, tumor was exposed by oblique lumbar incision. It became evident that the knob-like projection found on the lower circumference of the mass consisted of about two-thirds of the normal kidney, upon the upper pole of which, and connected with it, rested the large ovoid tumor, having the shape and size of a small cocoanut. An attempt to puncture the tumor failed. The stout needle used could not be forced into it, breaking off. Finally, with considerable trouble, a square aperture was cut into the bony investment of the tumor by means of a stout resection-knife. Beside a small quantity of turbid serum, the cavity contained nothing but a closely packed, nested mass of hydatid membranes, enclosed in a large outer membrane. All this material was scraped out with a sharp spoon; it was then seen that the rough, bone-like shell was bleeding wherever scraped, hence it became clear that it was organized. The oozing was so considerable that it was necessary to plug the cavity and to dress the wound. It may be added that the sharp spoon everywhere encountered the same resistance that an osseous cavity would offer. The place of communication between the hydatid cyst and the pelvis of the kidney could not be found.

Operation was borne very well; but in the course of the next week it became more and more evident that the cavity had not the slightest tendency to collapse and to diminish. It was evident that as long as the hard shell remained, closure of the wound could not be expected. In Simon's case a number of small, bony plates were expelled, having apparently sloughed away. In this case, however, we had not a rudimentary formation of small detached osseous plates, but a complete, bone-like capsule of extremely hard material, which, as seen later on, varied in thickness from between one-fourth to one-half of an inch, and was everywhere vascularized. Hence it was not probable that spontaneous expulsion would occur. As the outer sac of echinococcus cysts enters into intimate connections with all the organs of the vicinity, extirpation of the sac is rightly considered one of the most difficult undertakings. It was condemned by Simon as improper and inadmissible. In spite of these considera-

tions the contingencies of the case seemed urgently to point to the necessity of extirpation, which, with the consent of the patient, I determined to carry out.

On July 15, she was accordingly chloroformed. Operation was exceedingly difficult, troublesome, and laborious, both on account of the deep and inaccessible situation of a large part of the osteoid sac, and on account of the serious complications which had to be encountered in the shape of the invasion of both the pleural cavity and the peritoneum. Two of the lower ribs were excised, and even then the removal of the closely adherent calcareous masses was very difficult. Blunt dissection was inapplicable. The edge of the knife had to be used throughout. When the pleural cavity was widely opened, alarming cyanosis and heart failure set in. The pleural defect was quickly plugged, and artificial respiration instituted. After about five minutes the patient's condition improved so far that the operation could be continued. Just as on the pleural side, so toward the peritoneum the sac had incorporated the serous membrane, and a large portion of the peritoneum had to be taken away. As soon as the mass was detached from the peritoneum the defect was closed with a catgut suture. The irregular-shaped, calcareous shells composing the entire capsule were of different sizes, the largest one measuring over 7 cm. in both directions; however, most of them were much smaller and were connected along irregular lines by short and dense connective tissue, resembling the lines of cranial sutures in an infant's skull. Finally, after about two hours' hard work, all the calcareous masses were removed. The wound was packed and the patient brought to bed. Considerable collapse followed, recurring from time to time unexpectedly, so that considerable vigilance had to be exercised. Finally, on the third day, the pulse became steadier and the patient's face lost its pinched look. On July 19, the packings were removed from the main cavity, which had contracted very considerably. The pleural packings were removed on July 21, and from this date, progress was steady and rapid until the middle of August, when the patient aborted, but this did not retard recovery. The general condition steadily improved, and the large cavity contracted, so that the patient could be discharged cured, August 22. Professor Simon explicitly mentions that in his case (No. 6) the extruded plate-like mass contained osseous tissue. In this instance the pathologist found

calcareous matter only. The remarkable collection of potsherd-like concretions vividly recalled the shape of infantile cranial bones. The patient became perfectly well. On palpation the remnant of the kidney could be felt connected with a resistant mass resting above it, which undoubtedly consisted of shrunken cicatricial tissue.

POLYCYSTIC DISEASE.

The difficulty of recognizing this malady was again emphasized by the following case:

CASE LXXXIII.—*Polycystic left kidney. Nephrectomy. Cure.* (*Hospital Records,* 1910–1911, p. 1301.)

Sarah P., age twenty-seven, Russian, finisher. Admitted December 30, 1910. Six days ago began to feel acute pain in left loin, with vomiting. No radiation. Urination normal. On admission, healthy looking woman. In left loin a mass, of which only the lower pole can be felt. It moved with respiration, was not tender to touch; inflated colon masked it. Temperature 100° F., pulse, 100. Urine amber, clear, acid, 1019; no albumin or sugar; no blood; pus-cells and occasional hyaline casts. Cystoscopy. Left kidney, urea 0.3 per cent.; right kidney, urea 2 per cent. Radiograph: no calculus. January 5, 1911, nephrectomy. Individual ligatures. Kidney 8 x 5 x 3 inches, in state of polycystic degeneration. Uneventful recovery. Discharged cured January 24, 1911, with sufficient function of remaining kidney.

HYDRONEPHROSIS.

CASE LXXXIV.—*Hydronephrotic floating kidney of left side from flexion of ureter. Nephrectomy. Cure.* (Contribution, *loc cit.,* p. 680.) Example of Fenger's "sacculated cystonephrosis."

Mrs. T. R., age twenty-five. Admitted December 2, 1896. Patient declined risks of conservative measures. December 4, nephrectomy. Individual ligatures. Discharged cured, December 24.

The futility of ureteroplasty in the presence of infection of the hydronephrotic sac is illustrated by the following two cases:

CASE LXXXV.—*Chronic ascending pyelitis of left side. Hydronephrosis from stricture of renal orifice of ureter. Nephrotomy. Ureteroplasty. Renal fistula. Nephrectomy. Cure.* (*Hospital Reports,* 1899, p. 210.)

Harry G., age twenty-nine. Admitted January 6, 1898. Repeated gonorrhœal infection with cystitis. Last December violent renal colic of left side with temperature 105° F. Urine loaded with pus. January 7, nephrotomy. Kidney much distended by large quantity of ammoniacal seropurulent fluid. Lining intensely congested. Drainage. Profuse secretion of sinus. Urine voided by urethra 40 ounces per 24 hours, 1024, free from pus or blood. Evidently the left ureter was blocked. March 18, ureteroplasty. Pelvic orifice of ureter surrounded by an ulcer; the stricture permitting the passage of a fine silver probe only. Ureter severed below stricture, stump inverted and sutured from outside of pelvis. Implantation of distal part of ureter into most dependent part of sac. April 23, profuse urinary discharge from pelvic sinus, denoting closure of plastic stoma. Continued catheterization through external wound futile. Intense pyelitis. July 1, nephrectomy. August 2, discharged cured.

CASE LXXXVI.—*Periodical hydronephrosis of right side. Atrophic ureter. Ureteroplasty. Nephrectomy. Incision of periureteral abscess. Death.* (*Hospital Reports,* 1901, p. 333.)

Isidor B., twenty-nine years old, knitter. Sixteen months ago began to complain of severe pains in the right loin, which returned from time to time in the form of acute paroxysms lasting several days, to disappear as suddenly as they had come. No fever or vomiting during these attacks; never had been jaundiced. Attacks getting more and more frequent, occurring lately every four weeks. No blood in urine, nor painful or frequent urination, nor increase in amount of water at the conclusion of attacks, but now there was constant pain and fulness in right loin. Lost ten pounds in weight. On admission, January 5, 1900, thin, small, and emaciated. Marked retraction above both clavicles, dulness over right apex; lungs otherwise normal; heart, liver, spleen

normal; abdomen soft, moderately distended. Right loin: a tender, tense tumor, no fluctuation. Urine normal in every way. Respiration, pulse, and temperature normal. Daily quantity of urine varying between 24 and 40 ounces. January 15, ureteroplasty. Ether. Usual oblique incision; kidney exposed and developed. Was a slender and long organ. Pelvis baggy, dilated. Ureter exceedingly slender, almost infantile in size. Pelvis incised for the distance of an inch near ureter; orifice found with much difficulty; it was so small that a fine silver probe could be passed through only after much coaxing. The pelvic incision was continued down through the orifice of the ureter for one-third of an inch, this longitudinal wound being transversely united by three fine catgut sutures according to Fenger's procedure. Drain to the plastic suture. Extremely small dimensions of ureter rendered suture very difficult, and made success so doubtful that the idea was considered whether it would not be wiser to remove the kidney at once. Patient did very well after operation, temperature remaining normal, bowels moving without difficulty, sufficient quantities of normal urine being voided *per urethram*. Dressings changed daily; showed no signs of leakage up to January 19, when they were found soaked with urine. Directly after this soiling of the wound, fever set in, rising occasionally as high as 103°. January 21, external sutures removed, and outlet given to pus which had collected around upper part of the ureter. After this fever disappeared, but patient began to complain of painful and frequent urination, the urine containing pus and hyaline casts, and as most of the urine secreted by the right kidney escaped through wound, the fear seemed justified that the other kidney was diseased. January 28, milk injected into pelvis of right kidney. No traces of this appeared in water voided from the bladder. February 15, nephrectomy. Development of the strongly adherent kidney was difficult. It possessed two pelves and two ureters, the ureter coming from upper portion of kidney inosculating in the lower, much-dilated pelvis, upon which the plastic operation had been done. Ureteral orifice was completely obliterated, pelvic portion of incision patulous. Kidney was enlarged, congested, both pelves hyperæmic. Vessels and ureters separately tied, kidney removed, wound drained. Patient rallied slowly and imperfectly; energetic stimulation. February 21, temperature normal, 32 ounces

of alkaline urine, albumin, pus, no casts, oxalate of lime crystals. Wound doing well. March 1, patient much better, left the bed. Urine, 32 ounces, acid, 1020, no albumin, very few pus-cells, daily quantity 33 to 40 ounces. March 14, had gained 12 pounds in weight; wound nearly closed, there only a narrow sinus discharging a little seropus remaining. At own request patient was discharged, to be dressed by his family physician.

Readmitted April 20. General condition extremely poor. Patient profoundly septic, had high fever, vomiting; wound evidently septic, discharging large quantities of ichorous pus; pulse very feeble and frequent. Resistant, painful tumor, extending from loin downward toward ramus pubis; integument œdematous. Pressure over this swelling caused large quantities of pus to flow out of wound. Urine very turbid, scanty, 1008, albumin, much pus, no casts. April 21, chloroform. Scar reopened and incision carried well below anterior superior spine, through abdominal muscles into retroperitoneal abscess. There was then no visible communication with the peritoneal cavity. Operation lasted only ten minutes, but caused extreme exhaustion; persistent vomiting. Temperature remained high, never descending below 103° F.; pulse became constantly weaker and more rapid. Urine more turbid and scanty. Died on April 24, under the symptoms of septic peritonitis and nephritis. Autopsy: open communication of wound with right side of the pelvis, the seat of purulent peritonitis. Adjoining colon and a portion of omentum limited the site of peritoneal infection. More distant coils slightly injected; free serous exudate in the unaffected part of peritoneal cavity. Spleen slightly enlarged, soft, Malpighian bodies prominent. Liver congested and degenerated. Left kidney large, capsule slightly adherent; congested, granular and degenerated; pelvis contained one calculus; ureter normal.

Epicrisis.—A virulent infection of the wound had evidently occurred after patient's discharge from hospital. It had descended downward along the course of ureter and had involved the peritoneum overlying the infected space. This infection also rekindled the nephritis of the remaining kidney, handicapped by the presence of a renal calculus. In the light

of the issue, it would have been wise to remove the right kidney primarily.

CASE LXXXVII.—*Left hydronephrosis. Calculus. Atrophy of right kidney. Uræmia. Left nephrotomy. Right nephrectomy. Death.* (*Hospital Reports,* 1905, p. 167.)

Fanny I., age twenty-six. Admitted September 5, 1903. Forty-eight hours before was suddenly taken with agonizing pain in left lumbar region. Passed no urine within last 24 hours, nor did catheter draw any urine. On admission, internal organs normal. Rigidity of left half of abdominal wall. A smooth, rounded, tender mass in left hypochondriac and lumbar regions. Bladder empty. General condition bad; anxious face. Pulse 110, good; temperature 99°. Immediate nephrotomy of left side. Renal pelvis dilated, contained stones. Parenchyma thinned. Stones removed. Drainage. Reacted well, but general condition and pulse deteriorated, while secretion of urine, comprising 13 ounces on September 6, amounted to seven ounces on September 7, while on September 9 there was complete anuria. Increasing uræmia. September 9, right kidney exposed. After considerable search a small, round, soft mass, about two inches long and one inch wide, and connected with the ureter, was identified as the remnant of right kidney. This was extirpated. Uræmia was relieved, sufficient quantities of urine escaping through both external wounds and were withdrawn by catheter. Unfortunately, both wounds became infected, extensive necrosis of the tissues followed and sepsis led to the death of patient on September 22.

CASE LXXXVIII.—*Hydronephrosis. Nephrectomy. Cure.* (*Hospital Reports,* 1905, p. 170.)

Betsie K., age nineteen. Admitted November 2, 1903. Present illness, similar to another attack six months ago, was of two weeks' duration. Had pain in right side and back, chilly feelings and nausea. On admission, general condition good, internal organs normal. In right flank large, movable, smooth, tender mass. Urine contained a faint trace of albumin, was otherwise normal. Temperature and pulse normal. November 6, 1903, exploration revealed enormously distended kidney and pelvis, there was hardly any trace of parenchyma. Removal

of the organ. Uninterrupted recovery. December 12, discharged cured.

CASE LXXXIX.—*Hydronephrosis of right kidney with congenitally narrow ureter. Nephrectomy. Cure.* (*Hospital Reports,* 1905, p. 170.)

Sarah S., age twenty-five. Admitted March 30, 1904. Illness of two to three years' duration, with weekly attacks of headache, nausea, and constipation. On admission, general condition good, internal organs normal, right kidney palpable. Temperature 103°, pulse 120. Urine normal. April 2, exploration revealed enlarged kidney; pelvis much distended, ureter exceedingly small, cortex very thin, here and there cystic. As smallness of ureter precluded any plastic measure, kidney was removed. Uninterrupted recovery. April 26, discharged cured.

CASE XC.—*Hydronephrosis of right side. Pyelonephritis. Nephrotomy. Nephrectomy. Cure.* (*Hospital Records,* 1898, ii, p. 794, and 1899, i, p. 487.)

Mary L., age fifty, Russian. Admitted November 1, 1898. Ten children. Fifteen years ago sharp attack of pain in right side. Since then more and more frequently recurring attacks; nine attacks of renal colic in the last three months. Cloudy urine, frequent voiding, loss of flesh and strength. Right kidney palpably enlarged and painful. Urine 1024, acid, turbid, albumin, no sugar, much pus. Cystoscopy: moderate cystitis. Declined puncture. November 17, discharged. January 1, 1899, readmitted. Since discharge had had several attacks of colic with chills, high fever, and sweating. Temperature 98.6°. Swelling in right lumbar region much increased. January 13, cystoscopy. Left ureter normal. Orifice of right ureter congested; escape of turbid urine observed. January 17, nephrotomy. Incision liberated large quantity of turbid urine. Drainage to reduce size of tumor. February 17, typical nephrectomy, separate ligation of vessels. Ureter found much dilated; sewed into wound for drainage. March 20, ureter dry, inverted, and buried. March 26, discharged cured.

CASE XCI.—*Congenital subcapsular hydronephrosis. Nephrectomy. Death.* (*Hospital Records,* 1906–1907, vol. vii, p. 822.)

Isidor G., nine months old. Admitted September 23, 1907. Was born apparently healthy. Two months ago had severe

attack of high fever, lasting twelve days. Since then continuous evening fever. For two weeks much straining both at defecation and urination, the latter being very frequent. Lately mother noticed swelling in right loin. On admission, in right side of abdomen a mass extending from costal border to Poupart's ligament, and inward to median line. Abdominal muscles not rigid, mass not tender, not fluctuating. Per rectum mass could be felt two inches above sphincter. Aspiration drew a clear fluid, reaction neutral, color amber, containing urea and pus-cells. October 1, 1907, nephrectomy. Exposed tumor was evacuated by trocar puncture. In liberating the ventral aspect of the mass, a fluctuating, thin-walled sac was exposed, from which the ureter was seen emerging. This sac was closely adherent to the main mass, being evidently the distended pelvis. After ligation of vessels, the tumor was removed. Examination of specimen demonstrated the presence of a subcapsular hydronephrosis. A patulous defect of the parenchyma communicated with a large space between cortex and capsule proper. The capsule had become separated from the kidney, except where it was attached externally to the pelvis. Ureter congenitally small, its calibre not more than 1 mm. in diameter. Patient died two hours after operation in profound shock.

CASE XCII.—*Pyonephrosis of right side from infected hydronephrosis. Nephrotomy. Secondary nephrectomy. Temporary cure.*[1] (*Hospital Records,* 1907–1908, p. 947.)

Louis N., age fourteen, schoolboy, United States. Admitted September 14, 1907. Three years ago was operated on at Vienna for spina bifida. Incontinence of urine since birth. For past four weeks had been in another hospital, where instrumental examination of bladder was done under anæsthesia. Directly afterward high fever (103° F.) set in, whereupon he was transferred to Mt. Sinai Hospital. On admission, complained of sharp pain in right loin, where a mass, the size of a large apple and very tender, could be palpated. Temperature 104° F., pulse 118. Urine amber, turbid, alkaline, 1008, loaded with pus. September 19, right nephrotomy and drainage. Cortex studded with a number of small abscesses. Pelvis dilated and filled with pus; parenchyma pale, very scanty. Cystoscopy being impossible on account of incontinent bladder, on December 19 left kidney was

[1] June, 1908, readmitted with uræmia; died 18 hours after admission.

exposed and found to be of normal size and shape. December 26, right nephrectomy. Large, lobulated kidney with congested, flabby pelvis. January 30, ligature came away. February 4, 1908, discharged improved, with healed wound. Urine amber, clear, 1012, no pus-corpuscles, granular casts. Had gained considerable flesh; incontinence unchanged.

CASE XCIII.—*Calculous hydronephrosis of left side. Nephrectomy. Cure.* (*Hospital Records,* 1909–1910, x, p. 1471.)

Herman G., age twenty-nine, paper cutter, United States. Admitted, July 3, 1910. Sudden onset of hæmaturia two months ago, persisting ever since. Very profuse while patient was up and about; moderate while recumbent. Urinated every three hours. No pain of any kind; no fever or chills; no vomiting, but had lost twelve pounds in weight. On admission, marked anæmia, hæmoglobin 39 per cent. Large mass in left loin, not tender, fluctuating and very movable. Temperature 100° F., pulse 84. Urine red, turbid, neutral, full of red blood-cells, no casts. Urea 4½ grains to ounce. Cystoscopy: bladder and ureteral orifices normal. Left ureter, discharging bloody urine, alkaline, urea 0.7 per cent.; right ureter, amber, clear, acid, urea 3 per cent. Radiograph: two shadows in left kidney. July 7, exposure of left kidney by oblique incision. Puncture withdrew large quantity of bloody urinous liquid. Easy delivery. Individual ligature of vessels and ablation. Uninterrupted recovery. July 20, discharged cured.

Pathological Report.—Hydronephrosis, two pelvic stones. A small area of parenchyma left near lower pole.

Causes of death: (1) Uræmia (patient admitted with this condition); (2) secondary infection of sinus and peritonitis; (3) operative shock (patient an infant).

NEOPLASMS.

Statistics.

	Cases.	Deaths.
Cystic adenoma	1	1
Sarcoma	7	2
Hypernephroma	7	4
Carcinoma	3	1
Totals	18	8

Mortality 44.4 per cent.

Causes of death: operative shock, 2; peritonitis, 1 (transperitoneal nephrectomy for hypernephroma); pneumonia, 1 (epileptic patient); relapse, 4; total, 8.

The discouraging figures of our table show that nearly one-half of the patients operated upon for neoplasms have died. One-half (4) of the deaths followed directly after operation, and these must be attributed either to traumatism or to infection caused by the interference. The other half of the deaths (4) were due to a more or less rapid return of the disease itself. Furthermore, as the histories of the patients discharged as "cured" were not followed, there is no proof whatever of the permanency of their cures. On the contrary it may be assumed that relapses have also occurred among these.

The correctness of the diagnosis of "sarcoma" in some of the cases of older date may properly be questioned. Probably some of these would be classed to-day as hypernephroma.

The following case may serve as a good example illustrating the value of those principles of technic that were described in the first part of this essay, whenever the surgeon has to deal with a large and solid renal tumor.

CASE XCIV.—*Adenosarcoma of right kidney. Nephrectomy. Cure. Relapse. Death.* (*Hospital Records*, 1896, ii, p. 98.)

Dora G., age five and a half years, United States. Admitted June 13, 1896. Complained for six weeks of pain in right loin. The parents discovered a rapidly growing swelling there. No fever, no urgent or frequent urination. Lost flesh and strength. On admission, a well-grown child, emaciated and anæmic. Subcutaneous veins of right flank and abdomen much distended. In right loin a somewhat movable, ovoid, semifluctuating, smooth tumor, extending from diaphragm downward to below anterior superior spine, and inward to median line of belly. Temperature 99.4°, pulse 96. Urine clear, amber, acid, 1020; no albumin, blood, or pus. Inflated colon did not traverse median line; it was all situated in left half of belly. June 22, nephrectomy. Incision from margin of erector spinæ, running obliquely forward four inches beyond median line, practically bisecting the trunk. Intestines were gathered into a large, wet

and hot napkin and securely held by an assistant. The posterior parietal peritoneum was intimately adherent to anterior aspect of the friable tumor; the cæcum and transverse colon were displaced far downward and toward the left side. The stripping of the peritoneum from the anterior aspect of the tumor was attempted but given up on account of the certainty of rupturing into the tumor. Hence the parietal peritoneum was divided longitudinally along its reflection upon the tumor; then the tumor was everted sufficiently to make another incision close to and parallel with the displaced transverse and ascending colon. Above and below, these two incisions were connected by semi-elliptic incisions, thus circumscribing the entire adherent area of the peritoneum. The cæcum and colon were now easily gathered into the napkin. Thus the vena cava came into full view. This being followed upward, the renal vessels were readily encountered and tied off. The blood supply under control, the tumor was rapidly shelled out of the fatty capsule, adherent portions being tied *en masse* and divided. A rent of the vena cava caused by the tearing of a small, inosculating vein, was closed by running catgut suture. The defect in the parietal peritoneum was rapidly closed by running suture, then most of the abdominolumbar wound was sewed up by through-and-through silk sutures, and a gauze packing was left in its posterior angle, draining both the situs of the vessels and the peritoneal cavity. Deep shock was successfully overcome, and the child made an uneventful recovery. Discharged cured, September 6, 1896. March, 1907, readmitted with relapse, to which patient succumbed.

Case XCV.—*Large round-celled sarcoma, and stone of right kidney. Nephrectomy. Improvement. Relapse in wound. General sarcomatosis. Death.* (*Hospital Records,* 1898, i, p. 580.)

Joseph M., age forty-eight, clerk, German. Admitted November 5, 1897. Twenty years ago sharp attacks of pain in right side; then again ten years ago; since then every few months similar attacks, which have become more severe and frequent the last four months, with fever, and difficult, painful urination. Night sweats. In right lumbar region large, elastic, solid tumor, reaching four fingers below ribs. Moderate fever. Urine, acid, 1013, albumin, pus, no blood. November 8, cystoscopy. Right ureteral opening intumescent, jet of cloudy urine escaping from it. Left ureter normal. November 23, nephrectomy. After delivery,

large ovoid stone was felt in dilated, thickened pelvis of kidney. Peritoneum stripped back from reflection until six inches of vena cava were exposed. Renal vein and artery tied off. Ureter divided. No shock, little hemorrhage. Uneventful recovery from operation. Wound healed except where drainage had been employed, from where grumous material began to escape early in February, 1898. Patient gaining in weight, though relapse was evident. March 17, physical signs of pulmonary deposit. Died April 30. (The stone weighed 97 grammes.)

CASE XCVI.—*Hypernephroma of right, pyelitic kidney. Nephrectomy. Cure.* (Contribution *loc. cit.*, p. 698.)

I. D., peddler, age forty-four, had been suffering for eight months from frequent exhausting hæmaturia; no history of traumatism. Operation, proposed in October, was declined. Readmitted January 19, 1897. In right loin of anæmic and emaciated man, a movable nodular tumor, not painful to touch; did not fluctuate. All other organs normal. Urine sufficient, acid, 1021, much pus, a few red blood-corpuscles, much detritus in glairy mucus. Left kidney not felt. January 22, cystoscopy. Vesical mucous membrane normal. Massage along the course of right ureter caused a cylindrical plug of consistent pus to escape from orifice of same ureter. Left ureteral orifice normal, repeated escape of clear urine from it seen. Vermicular material gained from right ureter came away through catheter. It consisted of pus, mucus, and blood. January 26, nephrectomy. Vessels of pedicle and the ureter separately tied. Healing uneventful; discharged cured February 28.

Pathologist's Report.—Pronounced alveolar arrangement of sarcomatous elements, which derived their origin from endothelium of smaller blood-vessels of kidney.

CASE XCVII.—*Sarcoma of left kidney. Nephrectomy. Cure.* (*Hospital Reports*, 1899, p. 215.)

Max R., forty-eight years old, admitted September 29, 1898. During past three months noticed a gradually increasing, painful growth in left lumbar region. General condition poor. In left lumbar region large, hard, smooth, movable tumor, extending downward to iliac crest, divided by a transverse ridge into an upper and lower half, moving with respiration; the colon to its inner side. No fluctuation. Urine alkaline, 1018, no albumin or formed elements. Slight febrile reaction (99° to 100°).

October 3, exploratory cœliotomy at outer edge of left rectus muscle. Tumor found to be the left kidney. Peritoneum closed, then, together with colon, peeled away from lateral abdominal wall. Enlarged kidney was brought into wound with difficulty, pedicle ligated, organ ablated. Uneventful recovery; October 20, discharged cured. Kidney: Little of parenchyma remaining. Sarcomatous tissue, degenerated in places.

CASE XCVII.—*Sarcoma of right kidney. Nephrectomy. Cure.* (*M. S. Hospital Records,* 1897, i, p. 395.)

Isidore D., age forty-seven, Russian, salesman. Admitted January 19, 1897. Hæmaturia of long standing; noted swelling January, 1896. Urination not painless, not frequent. Urine neutral, 1018, albumin and pus; had lost flesh, but regained some. Physical condition fair and normal, except for large, firm, lumbar tumor. January 26, 1897, nephrectomy. Oblique incision extending from tenth rib to three inches below and outside of umbilicus. Peritoneum opened and sewed. Difficult enucleation. Elastic ligature. Packing and suture. Uneventful recovery. Ligature came off February 19. Discharged cured March 3, 1897.

CASE XCIX.—*Sarcoma of left kidney. Nephrectomy. Cure.* (*Hospital Records,* 1898, ii, p. 945.)

Max R., age forty-eight, presser, Russian. Admitted September 29, 1898. Three months ago noticed painful swelling in left loin. Loss of flesh. On left side, from ribs to iliac spines was a hard, smooth, movable tumor, its lower portion more prominent, moving with respiration. Colon was overlaying it. No fever. Urine negative. October 2, nephrectomy. Probatory incision along left rectus border demonstrated retroperitoneal situs of tumor. Closure of peritoneum. External incision enlarged upward to costal border and downward to within two inches of ilium. Peritoneum reflected forward and separated from tumor. Vascular adhesions clamped and tied. An incision vertical to first incision, extending backward into loin, was added. Delivery, ligature of vessels and ureters, and ablation. closure of wound with drainage. Uneventful recovery. October 20, discharged cured, with small sinus.

Pathological Diagnosis.—Round-celled alveolar sarcoma.

CASE C.—*Sarcoma of right kidney. Nephrectomy. Cure.* (*Hospital Reports,* 1901, p. 194.)

Jacob S., thirty-seven years old, admitted May 8, 1900,

Four months ago began to have severe pain in right lumbar region, radiating over whole upper abdomen, with vomiting. Pain continued more or less severe, but vomiting had not recurred. For six weeks urination frequent; not painful. During past two weeks urine bloody; pain radiating to the right groin. Denied gonorrhœa or syphilis. Urine red, acid, albumin, faint traces of bile, no indican, urea 10 grains to ounce; red and white blood-cells, epithelial cells, mucous shreds, hyaline and granular casts. May 11, cystoscopy. Trigonum congested about both ureters. Harris segregator: bloody urine from both sides. June 5, nephrectomy. Last rib resected. Kidney very large. Pedicle tied with silk. Tumor found to come from lower part of kidney, upper part apparently healthy. The following day icterus; tenderness in right side of the abdomen; this disappeared in a few days. July 7, wound almost healed; urine normal; discharged cured.

Case CI.—*Hypernephroma of right kidney. Nephrectomy. Cure.* (*Hospital Reports,* 1903, p. 168.)

Yetta E., fifty-six years old. Present trouble began four months ago with sharp pain in right lumbar region, radiating downward to groin, accompanied by hæmaturia. Had to stay in bed for several days. Since then similar seizures have appeared at shortening intervals, patient visibly losing strength and flesh. Admitted June 2, 1901. General condition, well nourished, anæmic. Temperature and pulse normal. Skin slightly icteric. Internal organs normal, except heart, which showed soft blowing murmur at apex, extending over pulmonic area. Large, nodular mass in right loin extending forward to within one inch of umbilicus. It could easily be manipulated, was fairly movable, and lay retroperitoneally. Urine between 25 and 35 ounces daily; albumin, many red cells, no pus, no elements suggestive of neoplasm. June 3, multiple aspirations; blood only was obtained. Temperatures normal, pulse normal. June 7, nephrectomy. Vessels separately deligated. Uneventful recovery. Discharged cured, July 28.

Case CII.—*Congenital cystic adenoma of right kidney. Nephrectomy. Death.* (*Hospital Reports,* 1905, p. 175.)

Helen R., six months old, admitted July 4, 1904. The baby was well until six weeks before, when mother noticed that abdomen was becoming large and tender. Urination normal. On admission, infant well nourished. Internal organs normal. Ab-

domen much enlarged, owing to presence of large, smooth, firm, elastic tumor, which occupied right loin, extending from free border of ribs to pelvis below, reaching over to left umbilical and hypogastric regions. Urine normal. July 4, 1904, nephrectomy. Tumor easily removed by combined lumbar and abdominal incision, after size had been reduced by evacuation of fluid contents. The operation lasted about 20 minutes, but in spite of all precautions to prevent shock the child died therefrom two hours after the operation.

CASE CIII.—*Hypernephroma of right kidney. Nephrectomy. Death.* (*Hospital Records,* 1904–1905, iii, p. 507.)

Mendel A., age forty-six, Russian, engraver. Admitted January 5, 1905. For the past year noticed weakness, pallor, and loss of flesh; eight months ago observed swelling in right flank, which became painful. Urination normal. Poorly nourished, very anæmic and cachectic. Pulse hard, arteries sclerosed. Scaphoid belly. In the right lumbar space, reaching to iliac crest, was a large, hard tumor, freely movable; colon passing in front of it. Urine normal and ample. January 7, nephrectomy. Posterior parietal peritoneum removed with tumor, gap closed with suture. Separate ligation of vessels. Specimen, 4½ x 5 x 3 inches. Specimen: hypernephroma, to which was attached normal kidney. February 14, relapse of tumor in right loin. February 22, fungus growing out of wound. Died of exhaustion March 10.

CASE CIV.—*Carcinoma of left kidney. Nephrectomy. Cure.* (*Hospital Records,* 1904–1905, iii, p. 508.)

Dora E., age forty-nine, housewife, Russian. Admitted November 26, 1904. Gradual weakness and loss of flesh since one year; anæmic; systolic murmur. In left loin a huge, movable mass extending downward to ilium and laterally to mammary line. Temperature and pulse normal. Urine 1020, acid, urea 10.2 per cent., casts, scanty pus. December 12, nephrectomy. Resection of eleventh and twelfth ribs. Difficult excision. Elastic ligature *en masse*. Rallied well from operation. Ligature came away on twenty-sixth day. Gradual, slow closure of wound. Gradual improvement of general condition, complained, however, of much pain in loin. March 1, discharged with short sinus.

CASE CV.—*Hypernephroma of left side. Nephrectomy. Death.* (*Hospital Records,* 1905–1906, vii, p. 701.)

Morris Sch., age forty-four, shoemaker, Russian. Admitted

November 3, 1905. Ten months ago began to have dull pain in left loin. Four months ago tumor appeared; since then has lost 30 pounds in weight and has become weak. Urination frequent. On admission: Apparent bulging of left loin and hypochondrium. A hard, solid, somewhat movable tumor extended from costal border downward to below level of umbilicus, and inward to within three inches of median line. Urine, normal. November 4, nephrectomy. Elastic ligature. Ureter divided separately. Pathological diagnosis, hypernephroma. Before the wound was healed, that is in the middle of December, evidences of a relapse were incontestable. Fungoid masses filled up the wound and involved all the structures of the loin. On February 23, 1906, a fecal fistula made its appearance. Death on March 4.

CASE CVI.—*Hypernephroma of left kidney. Nephrectomy. Peritonitis. Death.* (*Hospital Records,* 1906–1907, vii, p. 853.)

Isidor S., age forty, Roumanian, carpenter. Admitted August 14, 1907. In April, after alcoholic self-indulgence, passed bloody urine; the same night passed bloody urine twice more. Then passed no urine whatever for 24 hours, feeling sharp pain in left loin. Since then frequent hæmaturia and renal colic, pain radiating into left testis. On admission, well-nourished, healthy looking man. In left loin and hypochondrium a firm, rounded, and somewhat movable tumor, of the size of a large potato. August 19, transperitoneal nephrectomy. Incision through left rectus; posterior peritoneum divided outside of colon. Easy development of tumor and separate ligature of vessels. Drainage through stab in loin. Closure of two peritoneal incisions and abdominal parietes. Pathological report, hypernephroma. Much distention and incessant vomiting of dark material followed after a fairly good first day. Lavage and attempts at reducing distention by enemata failed to bring relief. Died August 21. No autopsy could be secured.

CASE CVII.—*Adenosarcoma of right kidney. Transperitoneal nephrectomy. Cure.* (*Hospital Records,* 1907–1908, viii, p. 954.)

Solomon S., age twenty-two, Russian, clerk. Admitted March 19, 1908. Two years ago patient accidentally noticed a small, hard, movable mass in right loin, which has steadily grown in size. Four weeks ago noticed pain; since then tumor has

grown more rapidly. No urinary disturbance, no fever. On admission: An oval, hard, nodular mass, in right loin, beginning from border of ribs, extending downward to crest of ilium and inward to median line. It is slightly movable, not painful to touch. Temperature 101° F., pulse 96. Urine: amber, clouded, acid, 1025, no blood-cells, a few white blood-corpuscles. Cystoscopy. Bladder and ureteral orifices normal. Right ureter, no urine, only amorphous material. Left ureter, traumatic hemorrhage. Urea 2.2 per cent. May 21, transperitoneal nephrectomy. Incision 8 inches long through right rectus. Peritoneum again divided at external border of ascending colon, which was stripped toward the middle of body. Ligation of ureter, exposure of inferior vena cava, which led to pedicle. Ligature of renal veins and of two right renal arteries. Removal of a number of large and hard glands, which lay close to inferior vena cava, some of them high up under diaphragm. Lumbar drainage through counter-incision. Closure of peritoneal and external incisions. Specimen: kidney-shaped tumor the size of a muskmelon, upper pole still containing normal renal parenchyma. Pathological report: mixed tumor, myosarcoma, and adenosarcoma. Uneventful recovery. Discharged cured, June 7, 1908.

Case CVIII.—*Hypernephroma of left side. Nephrectomy. Pneumonia. Death.* (*Hospital Records,* 1909–1910, x, p. 1467.)

Celia D., age fifty, housewife, Russian. Admitted August 22, 1910. Four weeks ago, while at sea, had first attack of sharp pain in left loin and iliac fossa with vomiting, the attack lasting four days. Lost 20 pounds in weight. No urinary disorder. On admission: Mitral insufficiency and stenosis. Temperature 101° F., pulse 100, respiration 24. Urine, amber, cloudy, acid, 1018, a few white blood-cells; no albumin or sugar. In left loin and hypochondrium, a large, smooth, globular, and very movable mass. August 30, nephrectomy. Easy extracapsular operation, with individual ligature of vessels. Specimen: Tumor size of a child's head. A strip of kidney tissue stretched over convexity of tumor. A sharp bronchopneumonia set in on second day after operation. September 7, patient very restless and at times violent, requiring restraint. After spells of violent excitement would fall into drowsiness verging on coma. Refused nourishment, was nourished by gavage. September 11, during a fit of violent tossing, the wound, seemingly healed, was torn

open. September 18, continued irrationality. September 24, wide area of dulness at base of right lung. Temperature 105° F. General convulsions followed by coma. October 3, died of pulmonary œdema. Pathological report, hypernephroma.

CASE CIX.—*Adenocarcinoma of left kidney. Transperitoneal lumbar nephrectomy. Cure.* (*Hospital Records,* 1909–1910, x, 1470.)

Blanche K., ten and a half years old, school girl, United States. Admitted August 21, 1910. Two weeks ago felt sharp pain in left loin. Urination normal. On admission: Pulse and temperature normal. Large, hard mass, slightly movable, extending to beyond median line of abdomen and below level of umbilicus. Urine amber, clear, acid, 1026, a few white blood-corpuscles. Urea 3.8 per cent. Cystoscopy: both catheters easily passed. Right side, abundant urine. Left side, no secretion whatever. Pirquet negative. Radiograph: no stones, homogeneous shadow. August 29: Long incision with convexity to median line. Peritoneum opened. A large plexus of distended veins seen under peritoneal covering of tumor. These were deligated and adherent peritoneum was removed together with tumor. Individual ligature of vessels; uneventful recovery. Discharged cured, October 3, 1910. Specimen, size of man's head. Pathological report: papillary adenocarcinoma.

CASE CX.—*Nephrolithiasis. Nephrolithotomy. Carcinoma of right kidney. Nephrectomy. Death.* (*Hospital Records,* 1910–1911, ii, p. 1297.)

Abram G., age forty-eight, Russian, tailor. Admitted December 19, 1910. Four months prior to this admission, nephrolithotomy was done at this hospital. No evidence of neoplasm at that time. Since discharge continuous pain in right loin, radiating to crest of ilium. Urination frequent, not painful. Urine clear. One month after discharge hæmaturia lasting one night, with urination every five minutes. Six weeks later similar attack; worm-like blood-clots passed. No fever. Since four weeks sinus opened in scar with scanty discharge. On admission, large, hard, irregular mass, size of fist, in right loin. Temperature 100° F., pulse 80. Urine: cloudy, amber, acid, 1020, no albumin or sugar, occasional red blood-corpuscles. No cystoscopy. Radiograph: no evidence of calculus. December 22, 1910: Reopening of oblique scar. Kidney much enlarged;

cystic at upper, very solid and hard at lower pole. Last rib resected. Cyst evacuated; 500 grammes of bloody fluid withdrawn. Difficult liberation of lower pole. Elastic mass ligature. Very large kidney consisting in its upper two-thirds of a multilocular retention sac; in its lower third, of a hard, solid tumor. Duration of operation, one hour and ten minutes. Deep shock. Died, December 23, twenty-four hours after operation.

CASE CXI.—*Hypernephroma of left kidney. Nephrectomy. Cure.* (*Hospital Records,* 1910–1911, p. 1299.)

Abe F., age forty-one, Austrian, butcher. Admitted March 8, 1911. Since three days dull pain in left loin, which grew into paroxysmal attack with chilliness and vomiting. Twelve hours before attack, passed bloody urine. No frequency of urination. On admission: Temperature 101.6° F., pulse 104. Neither of the kidneys could be palpated. Urine: clear, amber, acid, 1026; no tubercle bacilli, no sugar, no albumin; many red blood-cells; no casts. March 13, cystoscopy. Left side: loaded with red blood-corpuscles. Right side: clear. Radiograph: no evidence of calculus. March 16, nephrectomy. The high situation of the tumor made it inaccessible through usual oblique incision, hence a second vertical incision having exposed the eleventh and twelfth ribs. These were resected, whereupon it was found that the enlargement of the kidney mainly involved its upper pole. Reflection of peritoneum was stripped back; exposure of vessels; individual ligatures. Specimen: Kidney of normal size and shape forms the lower pole of mass. Upper part of mass the size of a fist. Pathological report: Mixed tumor. Hypernephroma and spindle-cell sarcoma. Uneventful recovery. Discharged cured, March 29.

OBSERVATIONS ON THE DIAGNOSIS OF RENAL TUBERCULOSIS, THE INDICATIONS FOR NEPHRECTOMY IN ITS TREATMENT, AND THE TECHNIC OF THE OPERATION.

BY PAUL MONROE PILCHER, M.D.,
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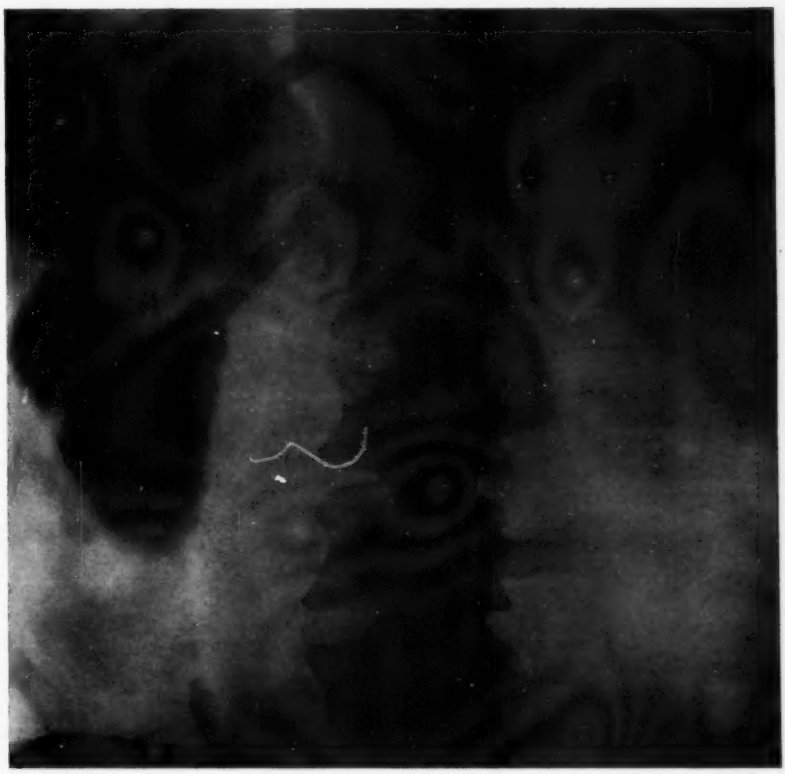
THE kidney, when once infected with tuberculosis, is doomed to destruction. A very occasional case of supposed renal tuberculosis has been reported in which the diagnosis has seemed reasonably certain, and later examination has shown the case to be apparently recovered, and yet, despite such clinical evidence, there is no record of a case of cured tuberculosis of the kidney having been demonstrated at autopsy.

The disease is frequently present for a long period of time before it gives rise to distressing symptoms,—two, three, four, or five years, and then attention is called to it on account of the bladder involvement. Some cases may go on for many years without seeming to affect the general health of the patient. One case of our own gives a history which goes back for 22 years, and yet all of that time the patient's general health was excellent. The record of this case is as follows:

CASE I.—*Tubercular ulcer of the bladder. Tuberculosis of the lung. Tubercular epididymitis. Tuberculosis of the kidney.* The patient, a man, aged eighteen, had begun to have frequent micturition two years before admission, with occasional attacks of hæmaturia; constant hæmaturia for three weeks before admission, severe pain upon passing urine, has enlargement of both epididymes, with consolidation at apex of left lung.

Suprapubic cystotomy, by Dr. Lewis S. Pilcher, November 4, 1889: Transverse incision. The bladder when opened revealed in its base an eroded tubercular ulcer about one inch in diameter with overhanging edges; considerable sabulous matter and mucopus were removed from the bladder; the ulcer was curetted and

FIG. 1.



X-ray of the case of tuberculosis of the kidney shown in the colored plate. The dense shadows have been produced by the putty-like contents of the kidney. The concretions in the ureter at the brim of the pelvis are clearly shown. The lower part of the ureter contains a nest of stones which is shown in the next figure. In this case the kidney and ureter as far down as the brim of the pelvis were removed.

FIG. 2.

Shows the pelvis in the same case as the previous figure. The concretions in the ureter near the pelvic brim are shown at the top of the picture. In the lower end of the ureter, just at the bladder, a collection of small phosphatic stones is seen. A close inspection of the picture will show that they are held in a cavity and fixed in position. At operation the kidney and ureter to the pelvic brim were removed, and the stones from the lower end of the ureter discharged themselves through the bladder within three weeks after the operation.

the cavity of the bladder filled with iodoform gauze; median perineal section was then done with introduction of hard rubber drainage tube (Watson) to base of bladder. By systematic antiseptic irrigations of bladder a gradual improvement in condition of patient was brought about. The suprapubic wound healed. The patient returned to college at the end of a year from the time of his entrance to the hospital, urinating ten times during the night.

In 1896, seven years later, he reported that his general health was good, urinating from 17 to 20 times daily, without pain. At times, when sleeping soundly, he would urinate unconsciously; still mucopurulent deposit in urine. There was still present a tuberculous deposit in one epididymis.

In April, 1906, he asked for treatment for the relief of his irritable bladder and frequency of urination. He was passing his water at least every hour, sometimes oftener. Repeated irrigations and the use of silver nitrate decreased the irritation of the bladder and increased his vesical capacity to nearly four ounces. Gradually, however, the frequency returned, and although he had periods of entire freedom from irritation lasting for three or four months at a time, still the condition grew gradually worse.

In June, 1910, a cystoscopic examination was made by Dr. Paul M. Pilcher and a small excoriated area was found on the right side of the bladder. This was curetted. The ureter openings could not be catheterized, inasmuch as the base of the bladder was very much deformed. The next day after leaving the hospital he returned on account of a violent hemorrhage into the bladder, which was controlled by rest and irrigation. He improved somewhat after this.

In January, 1911, he was examined at the Johns Hopkins Hospital by Dr. Hugh Young. X-ray examination showed a shadow four inches long and one and a half inches in diameter in the left lumbar region (Figs. 1 and 2), sugestive of a very large calculous mass.

No tubercular bacillus could be demonstrated in the urine at any time. The ureters could not be catheterized. The opinion was expressed that the irritability in the bladder was probably due to old tuberculosis of the left kidney.

Nephrectomy was done by Dr. L. S. Pilcher on May 3, 1911. The condition of the kidney was as shown in the specimen de-

picted in Fig. 3. The ureter was removed nearly down to its entrance into the bladder; in portions it seemed practically normal; at one point it was practically occluded by impacted calcareous concretions. The patient made a good recovery, both the upper and lower wounds being drained. The sinus closed after injections with bismuth paste.

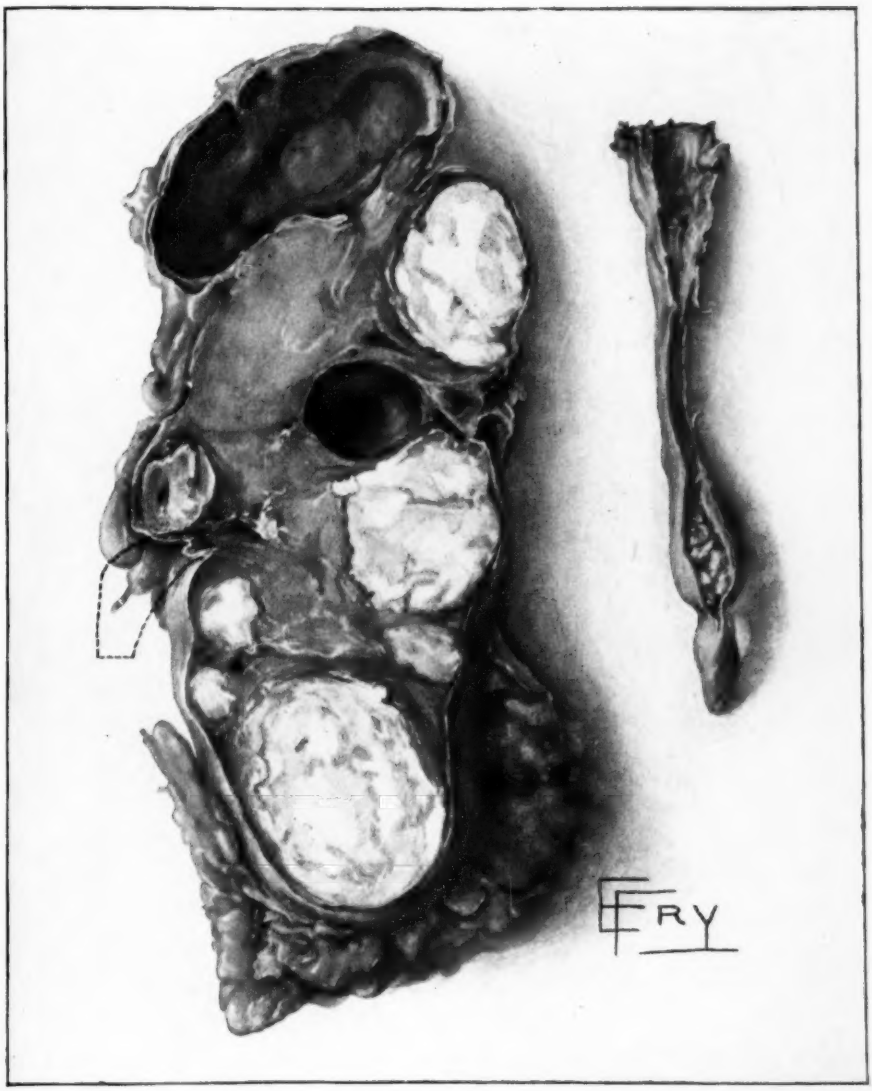
The large kidney was found to have undergone various transformations involving its whole mass. The pyramidal tissue had been replaced by fatty and fibrous tissue, and the cortex was replaced by a series of cysts, some filled with serum, but the most filled with a calcareous putty (see colored plate). The later effect of the removal of this degenerated kidney and ureter was most happy. The irritability of the bladder ceased so that the patient was able to retain urine for from four to five hours. He became robust, and within a few months married.

Another interesting feature of the case was the hard phosphatic mass which had formed in the ureter at the pelvic brim; this was removed and is shown in the colored plate. Another feature was the dilated lower end of the ureter, which contained several calculi (Fig. 2). These are well seen in the X-ray plate. After removal of the kidney, these calculi were spontaneously evacuated *per urethram.*

As a rule, however, after the disease has remained quiescent for a time, there comes a period of extension, with its train of distressing symptoms and gradual failing of the patient.

In some cases the clinical fact may be observed that during the period of active invasion of the disease, when the kidney is throwing off loads of pus and tubercle bacilli, and is secreting much more urine than its fellow, we frequently find evidences of active tuberculosis in other parts of the body—the lungs, the uterine adnexa, the epididymis, or the prostate. As the active processes in the kidney become controlled or develop into a slowly progressive lesion, the general health of the patient improves and the secondary or associated tubercular lesions show less and less evidence of activity and often entirely disappear, despite the fact that the lesion in the kidney still exists. It seems logical to suppose that there must have been some cases of tuberculosis of the kidney cured without

FIG. 3.



Tubercular kidney undergoing regressive changes after spontaneous arrest of the tubercular process with a history of twenty-five years since the inception of the disease. Note the cortex replaced by a series of cysts, some serous, some filled with calcareous material; note the pyramidal tissue replaced by fatty fibrous tissue; note the ureter irregularly dilated and containing a quantity of calcareous material. Chief symptom, persistent vesical irritability. All symptoms relieved by removal of the degenerated kidney.

removal of the kidney, but the fact still remains that no conclusive evidence has been produced to substantiate this inference.

Tuberculosis of the kidney is characterized by fewer symptoms referable to the kidney than any other inflammatory lesion of that organ, and at the same time it may present any of the classical signs which we are accustomed to associate with other lesions.

Calculi form in tubercular kidneys and befog the diagnosis. Plugs of blood and pus block the ureter and give rise to renal colic; multiple strictures of the ureter form, and produce hydronephrosis and hydro-ureter, with their train of symptoms. A persistent hæmaturia or a sudden large hemorrhage may be the only definite signs of the disease. Even the X-ray may deceive us, for the large accumulations of putty-like material which forms in the chronic cases, and the harder concretions which we occasionally see, give shadows on the plate which are very misleading (see Figs. 1, 2, 3 and 4).

How much value are the various clinical manifestations in establishing a diagnosis?

1. *The symptoms referable to the kidney itself:* Palpation usually shows some enlargement of the organ, which is moderately tender, but it is frequently the case that the companion kidney is more greatly enlarged and more tender. Pain referable to the kidney is not a prominent symptom until late in the disease and may be complained of only on the side of the normal kidney. Some cases, however, have severe colic due to the plugging of the ureter, while others suffer from moderate and long-continued pain, but these cases are the exception.

2. *The bladder symptoms:* These are by far the most prominent feature of the disease and consist of painful and frequent urination, both day and night, and a marked polyuria and pyuria.

3. *The physical examination:* Very little can be learned from this. Frequently we find evidences of tuberculosis in other parts of the body, especially in the lungs and epididymis

and vas deferens. Until late in the disease, the tubercular involvement of the kidney seems to affect the general health of the patient very little.

4. *Chemical examination of the secretions:* The microscope and test tube often give us our first clue to the nature of the disease. We find first a marked polyuria, which is quite a constant phenomenon. The urine is pale, acid in reaction, of low specific gravity and contains albumin in proportion to the changes in the kidney and the amount of pus present. Pyuria is a constant feature and is very markedly increased when the bladder is involved. In an advanced case the urine collected from the bladder will be thick with pus and the flocculent whitish flakes of pus and necrotic tissue adhere to the side of the glass container as the fluid stands, settling very slowly to the bottom of the glass. If in the same case the catheter is passed into the ureter leading from the diseased kidney, the specimen collected will be found to be quite different from that collected from the bladder—the amount of pus being very markedly less, although only one kidney is affected. The specimen from the kidney direct looks like clear water, is of very low specific gravity and shows very little macroscopic pus.

Hæmaturia is one of the less frequent clinical manifestations of the disease and occurs in about 25 per cent. of the cases. A few blood-cells mixed with the pus-cells are frequently found, especially when there is an ulcerative cystitis. When hæmaturia does occur it is apt to be fairly small in amount, but continuous.

Tubercle bacilli: It is not always possible to discover tubercle bacilli in the urine. However, they are always present at some stage of the disease. Their presence will give us some clue as to the stage of the disease and the condition of the kidney from which they come.

It has been our experience that when we have a miliary tuberculosis of the pelvis of the kidney, tubercle bacilli are always found in large numbers. When we have an ascending tubercular pyonephrosis, with extensive destruction of the

FIG. 4.

Shows shadows in another case of tuberculosis of the kidney, in which the same putty-like material was present in the kidney substance. The case was one of continuous hæmaturia, which was relieved by removal of the kidney.

FIG. 5. FIG. 6.

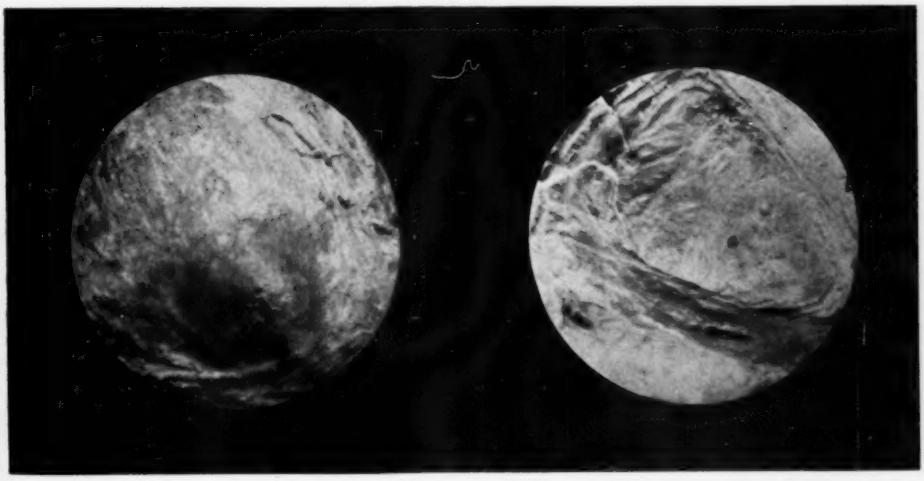


FIG. 5.—Shows an area of tubercular infiltration of the bladder wall. The pre-ulcer stage as here seen is characteristic of the disease. (Pilcher's Cystoscopy.)

FIG. 6.—Showing the stiff, dilated ureter opening corresponding to a tubercular kidney. (Pilcher's Cystoscopy.)

FIG. 7.

Tubercular kidney, with abscess formation in upper pole and tubercular pyelitis. In this case there were many tubercle bacilli found in the urine, which is characteristic of such a condition.

FIG. 8.

Tuberculosis of kidney. Note multiple tubercular abscess cavities in the cortex and in the pyramid-pelvic portion. Note the thick pseudocapsule from inflammatory thickening of the perinephric fatty tissue. In such a case it is difficult to demonstrate tubercle bacilli in the urine.

kidney, we generally find tubercle bacilli with enormous amounts of pus. With an old caseous tuberculosis of the kidney, especially where very little secreting surface is left, the amount of pus secreted is smaller and we seldom find tubercle bacilli. Therefore, if in a given case we find many tubercle bacilli and few pus-cells, we do not expect a marked destruction of the kidney, and the case presents the possibilities of benefit from the use of tuberculin injections.

If a case presents a large number of tubercle bacilli, enormous amounts of pus, a greatly enlarged kidney, we suspect an ascending infection and a possible bilateral involvement. An example of this type is shown in Fig. 7.

If we have all of the clinical findings of tuberculosis of the kidney of long standing, without the continued presence of tubercle bacilli in the urine and with very little change in the health of the patient, we expect to find a kidney fairly well destroyed, with large deposits of putty-like, inspissated pus impregnated with lime salts replacing the kidney tissue; such cases usually give symptoms of long-continued bladder irritability with pyuria.

5. *Instrumental examination:* This is indicated in almost every case. The presence of miliary tubercles, tubercular nodules, tubercular ulcers, and marked deformity of the ureter opening are strong confirmatory evidence of tuberculosis of the kidney, for I think it may be safely stated that in 95 per cent. of the cases tubercular involvement of the bladder is secondary to tuberculosis of the kidney. Without going into the details of a cystoscopic examination in these cases, it may be stated that a diagnosis of tuberculosis of the kidney can almost always be made even when tubercle bacilli are absent from the urine. A study of the meatus ureteri (Figs. 5 and 6), the urinary reflux, the results of ureter catheterism, and an examination of the urine collected separately from the two kidneys, together with functional tests of each kidney, will practically establish the diagnosis in nearly every case. It may be that we can only diagnose a pus kidney on one side and a normal kidney on the other, without being able to say definitely

that the case is a tubercular one. It must be remembered also, in making a functional test, that only a limited portion of the kidney may be involved and therefore the function of the organ may be perfectly normal.

The character of the urine from each kidney varies from time to time and it is instructive to compare the output from a tubercular and a non-tubercular kidney in the same patient at an early and during a later stage of the disease.

TABLE OF COMPARISON BETWEEN THE TUBERCULAR AND NON-TUBERCULAR KIDNEY.*

	Tubercular Kidney		Non-tubercular Kidney	
	Early Stage	Late Stage	Early Stage	Late Stage
Amount	Greatly increased	Changeable	Normal	Increased.
Color.....	Very pale, colorless	Turbid	Normal	Pale.
Reaction	Acid	Neutral or alkaline.	Acid	Acid.
Albumin.....	Trace	Heavy trace	None	Trace variable
Specific gravity..	Very low, 1002–1008	Low	Normal	Low, 1008–1012.
Indigo-carmin...	Fifteen to twenty minutes, pale green	May find no reaction, or late	Dark blue in five to ten minutes	Delayed ten to twenty minutes.
Phloridzin injection 0.01 gm. ..	Sugar appears late; thirty to forty minutes	No reaction or only after an hour	Sugar appears in ten to fifteen minutes	Sugar appears in fifteen to twenty minutes.
Animal injection.	Positive for tuberculosis	Positive for tuberculosis	Negative	Negative.
Microscopic examination	Tubercle bacilli, pus-cells, occasional blood-cells, renal cells	Tubercle bacilli; large amount of pus; rarely blood-cells, hyaline and granular casts	No bacteria; few renal epithelia	No bacteria; large amount of granular renal epithelium; few hyaline casts few leucocytes and red blood-cells.

*From the writer's work "Practical Cystoscopy," page 325.

6. *Rectal and vaginal examination:* Here we have really a very valuable guide in our diagnosis, especially in those cases

where it is impossible to catheterize the ureter on the diseased side. In a number of cases the writer has been able to make a definite diagnosis by this means alone, although it does not tell us the condition of the companion kidney. Almost invariably we find the lower segment of the ureter thickened and cord-like on the diseased side and easily palpable to the examining finger. It is also sensitive.

7. *The X-ray:* We have found this an important aid in certain cases where it has been impossible to catheterize the ureters. Where the disease has been of long standing, the X-ray plate may show shadows of varying density, due to abscess formation or to large collection of phosphatic deposits. The X-ray examination is important more as confirmatory evidence.

8. *Surgical operation:* At times it is impossible to determine definitely the exact nature of the disease, or, in fact, its location, without exploratory operation, but this is the great exception. We cannot agree with surgeons who advocate bilateral exposure of the ureters and catheterizing the kidney pelves directly, for we believe that unless the disease has reached an inoperable stage, a diagnosis can be made with fair certainty by other means.

It may be said in general, that while the symptoms arising from tuberculosis of the kidney may be interpreted as those due to a non-specific cystitis, other suppurative diseases of the kidneys, pyelitis, nephrolithiasis, tumors, and renal varix, yet the disease is not easily confused with them. The cardinal symptoms are the long-continued pyuria, which resists all local treatment of the bladder, marked polyuria, frequent and painful urination, day and night, a contracted and intolerant bladder, the presence of tubercle bacilli in the urine. Confirmatory evidence is to be had as the results of cystoscopy, ureteral catheterism, and the X-ray.

INDICATIONS FOR TREATMENT.

Every individual case must be judged for itself. In general it may be said that in all cases where there is extensive tuberculosis of the lungs, removal of the kidney should not be

considered; where, however, there is only a slight involvement of the lung, nephrectomy may be safely done.

In cases of bilateral involvement, operation should be done only as a last resort, and especially in these cases must the decision rest with the individual surgeon. In one case of my own, nephrectomy was carried out on one side owing to the extensive septic tubercular process in the one kidney, while the other kidney was also known to be involved. In this case all the septic manifestations were controlled and the patient was restored to a fair degree of health, until last heard from two years after operation.

A second case of bilateral involvement, in which neither kidney was very markedly diseased, when first seen, no operation was done. For seven years the patient has been made comfortable by occasional applications to the bladder and use of the X-ray. At the end of seven years, however, she is rapidly going down hill, both kidneys are enormously enlarged and equally affected, her lungs are involved, and her intestinal tract shows evidence of tubercular lesions. In this case all of the distressing symptoms have been kept under control for seven years without operation.

A third case is one in which there was an ascending infection in a young lad seventeen years of age. He was having very active symptoms referable to the right kidney, with marked sepsis, high temperatures, and losing ground very rapidly. In this case it was thought best to remove the kidney, which was done. He lived in comparative ease for four or five weeks, when the companion kidney, which was also involved, became incompetent, and he died six weeks after the operation. This is the only case of tuberculosis of the kidney that I have operated on, where the patient died within a year of the operation; perhaps it was an error in judgment, although the septic condition present demanded immediate relief. The kidney in this case is seen in Fig. 9.

There are certain advanced cases in which it is inadvisable to do a nephrectomy, even where we do not know positively that both kidneys are involved. The only absolute guide which can be set down in choosing these cases is an estimate

of the renal function and the degree of other involvement of a tubercular nature throughout the body. Aside from these objections, it is our rule to advise nephrectomy in every case of unilateral tuberculosis of the kidney, providing the companion kidney shows a normal secretion, or an almost normal secretion.

TECHNIC OF NEPHRECTOMY.

In all of our cases, so far, we have performed the nephrectomy through a lumbar incision. The incision starts parallel with the outer border of the erector spinæ muscle, which usually is two and a half to three inches from the spines of the vertebræ. Beginning at the lower border of the eleventh rib, the incision is carried downward and slightly forward to a point an inch above the crest of the ilium, and then is carried forward, parallel to the crest of the ilium (Fig. 10).

The posterior layer of the lumbodorsal fascia is divided, together with some of the fibres of the latissimus dorsi muscle. Without further cutting of any muscle structures, the finger is entered into the triangle just below the twelfth rib, and a blunt dissection is made with the fingers, separating the lowest insertion of the serratus posterior inferior from the posterior edge of the internal oblique muscle. The remaining layer of the lumbar fascia is divided and the fatty bed of the kidney itself comes into view. The quadratus lumborum muscle is posterior to the line of incision. The ilio-inguinal and iliohypogastric nerves are usually found running along the under surface of the posterior muscle mass. These should be carefully identified and retracted out of the way. After the muscles have been found, the incision is completed downward and forward by cutting the fibres of the internal oblique muscle at right angles to its attachment to the crest of the ilium. The incision is completed above by freely exposing the eleventh and twelfth ribs.

Even with this wide exposure of the perirenal space, it very frequently happens in these cases of tuberculosis of the kidney that we have not sufficient room to carefully secure

the pedicle, and to still further widen this space it has been our custom to resect the twelfth rib in order that it might be retracted upward. Dr. W. J. Mayo (ANNALS OF SURGERY, vol. lv, p. 64) has shown us that the rib may be dislocated upward by dividing its muscular and fibrous attachments, especially the quadratus lumborum and the lateral arcuate or lumbocostal ligament, which binds the twelfth rib to the transverse process of the first lumbar vertebra. By putting a retractor under the angle of the twelfth rib, the exposure of the kidney pedicle is much more complete. Dr. Mayo tells us that in this way danger of injury to the pleura may be avoided, but in one case of our own in which this was done, the pleura and the diaphragm were ripped from the rib by the forcible retraction.

It is important before proceeding to the removal of the kidney to complete all of the details above mentioned, for with a proper exposure and plenty of room to work in the kidney may be removed much more quickly and the pedicle may be more easily secured.

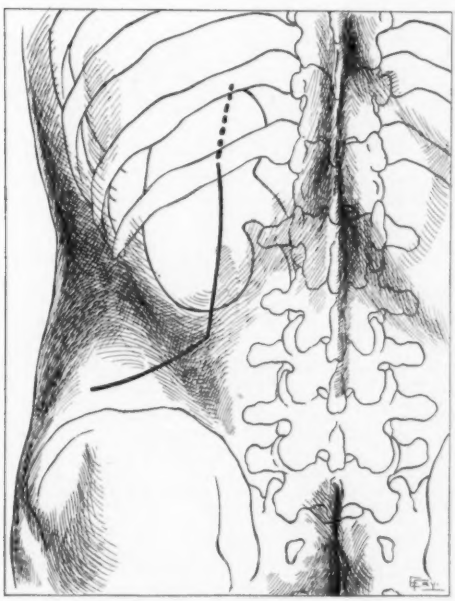
After this has been accomplished, the kidney is separated from its perirenal attachments by blunt dissection with the fingers, a ligature of catgut securing the upper mesh of venules which frequently enter the upper pole of the kidney, and a similar ligature surrounding the tissue attached to the lower pole before they are divided from the kidney (Fig. 11). The kidney is brought up into the wound and the pelvis and pedicle are cleared of all fatty tissue and adhesions by a blunt dissection with the finger covered with gauze (Fig. 12). It is remarkable oftentimes how quickly and completely this can be accomplished. It gives a much better exposition of the vessels entering the kidney and allows of their being more perfectly secured by ligature. A heavy chromic gut ligature is then placed around the vessels entering the kidney and the ligature is tied. A second chromic gut ligature is also applied before the vessels are cut. The ureter is not disturbed at this time.

After the vessels have been cut, the tissues are stripped

FIG. 9.

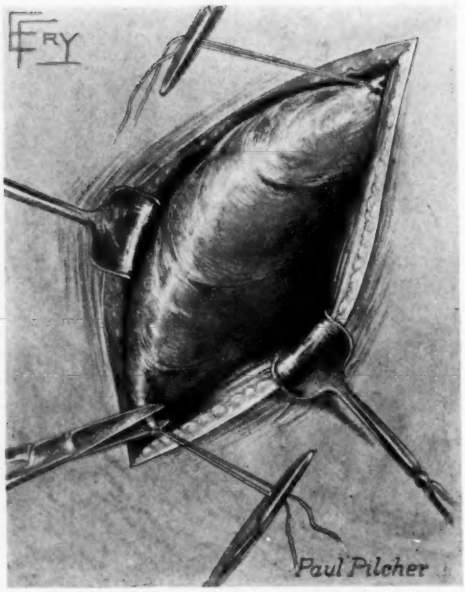
Tubercular kidney, showing abscess formation with subcapsular hæmatoma.

FIG. 10.



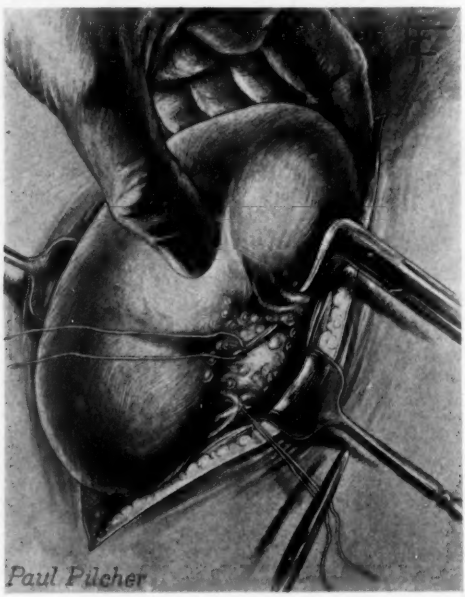
Line of incision for exposing kidney.

FIG. 11.



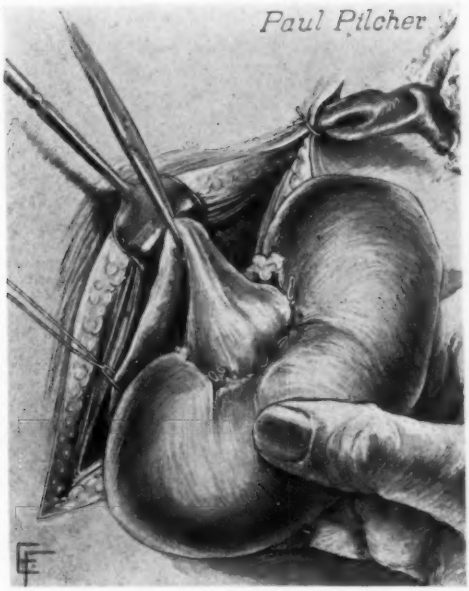
Freeing the kidney in order to bring it more freely into the wound. It will be found that there are generally vessels entering the kidney both at its upper and lower pole. In order to prevent hemorrhage these tissues, whether they contain vessels or not, are tied with catgut ligature and divided.

FIG. 12.



Nephrectomy. The kidney has been brought into the wound; the posterior surface is shown. The small vessels at the lower pole of the kidney are first ligated and cut; the pelvis and first portion of the ureter are identified; a ligature carrier is passed underneath the vessels and the vein and artery tied by a single, strong catgut ligature.

FIG. 13.



Nephrectomy. In removing an infected kidney, whether it be from tuberculosis or other bacteria, the vessels having been ligated, the kidney and ureter dislocated to the lower angle of the wound, the upper portion of the wound is closed before the ureter is cut. This is done to prevent infecting the deeper portions of the wound from which the kidney has been removed.

up from the ureter for a distance of three or four inches and the kidney, still attached to the ureter, is carried down to the lowest angle of the wound. Then, before dividing the ureter and exposing the wound to any infection, the upper portion of the wound is closed, the deeper layers being brought together by sutures of catgut and the fascia accurately resutured and the muscle masses brought into apposition, obliterating all dead spaces (Fig. 13). This practically closes the longitudinal arm of the incision.

Treatment of the Ureter.—Unless the ureter contains concretions or deposits of lime salts above the brim of the pelvis, no attempt is made to remove more than the first three or four inches of the diseased ureter. It has been our experience that no matter whether the ureter be a contracted thickened ureter with a narrowed strictured lumen, or an enormous hydro-ureter, the after-course of the case is just as satisfactory, if the ureter is properly treated. Where concretions or phosphatic deposits are present, we attempt to remove these if they lie above the brim of the pelvis, otherwise they are not disturbed.

In the ordinary case, after the upper portion of the wound has been closed, the lumen of the ureter is injected with about 40 minims of pure carbolic acid at a point as far down on the ureter as practicable (Mayo). The needle is then removed and the ureter is ligated above and below the point of injection. The ureter is cut between the two ligatures and the stump of the ureter again carefully cauterized. It is then allowed to drop into the depths of the wound. A cigarette drain is carried to the surface from the cut end of the ureter and the rest of the wound is closed by careful suture. We have had no trouble from the carbolic acid which we have injected, and believe that none of it reaches the bladder, owing to the diseased condition of the ureter itself, which rapidly takes it up.

Following out this special technic, we have obtained primary union in three of our recent cases, the patient being out of bed entirely healed at the end of two to three weeks.

Injury to the Pleura.—Our experience agrees with that of Dr. Mayo, in that we do not fear injury to the pleura in these operations, although it has occurred occasionally. In no case has there been collapse of the lungs, and in no case has there been any unpleasant after-effect therefrom.

Treatment of the Bladder.—Post-operative treatment of the bladder is a question which will not be discussed here, further than to say that, as a rule, very little need be done to the bladder after the source of the tubercular infection has been removed.

ACUTE HÆMATOGENOUS INFECTION OF ONE KIDNEY IN A PERSON APPARENTLY WELL.

BY GEORGE K. DICKINSON, M.D.,

OF JERSEY CITY, N. J.

"THE first thing essential to a correct diagnosis of certain morbid conditions is that the practitioner must be aware that such conditions do sometimes exist." This remark is peculiarly applicable to the infections which run a dramatic course and are but rarely observed. The study of the mistakes in diagnosis of our best clinical surgeons demonstrates that very acute fulminating lesions met for the first time are slowly diagnosed and often misunderstood, sometimes at the expense of a life.

A surgeon may be well read in literature, his mind may be alert to the possibilities of the acute abdomen, and yet when an anomalous case arises diagnosis and proper treatment are often so delayed that the case ends in a tragedy.

So much is heard of the acute appendix and gall-bladder, of perforations of the stomach and duodenum, and of other common lesions that the general practitioner seldom delays long in obtaining counsel, nor does the surgeon wait for positive indications before operating. Very little is heard, however, of the acute kidney. We are not compelled to read titles which appeal forcibly like the headlines in the daily press. Our literature is not teeming with case reports to take our attention, yet the profession knows, almost subconsciously, that an acute kidney may exist, but in differentiating a diagnosis is prone to think of the more commonplace, and rules with the probabilities.

In retrospect it is not to be wondered that the kidney should more often be the site of pyogenic inflammation, for its one province is to excrete active bacilli from the blood.

In all infections, typhoid fever, pneumonia, tuberculosis, etc., the kidney excretes live germs, and is not infected. Pyelitis, the result of the passage of germs, is not uncommon.

The blood supply of the kidney comes through the renal artery (which is very large considering the size of the organ), and also anatomically and freely from the blood-vessels of the pelvis, particularly in the female. The resisting power of the healthy kidney to infection seems to be as great as the substance of the liver, which is constantly bathed with impure blood. Both of these organs have that acquired immunity which comes from the evolution of a function.

A man in apparent health may have some defect in one kidney which lowers its vital resistance. Again, of all the internal viscera, the kidney is most liable to suffer from traumatism. Clinical histories tell us that mild trauma may sometimes snap a kidney in half. May not a mild trauma of every-day life, not noticed nor remembered, temporarily at least reduce the vitality of one kidney? Brewer has well shown that a healthy kidney will eliminate pathogenic germs thrown into the ear of a rabbit, whereas if that kidney be slightly traumatized, we may find infarcts.

The symptomatology of an acute kidney as written varies with the intensity of the infection. A subacute inflammation with the lesion progressing over more than ten days, in which there is no marked enlargement of the organ, gives time for study and examination and a symptomatology pointing directly toward the diseased organ. But even under these conditions our best men have erred in diagnosis. The pain may be referred, points of tenderness may not be only at the costovertebral angle and over the kidney, but may also be present on a line of the ureter or even across the abdomen. The systemic reaction may be intense; there may be high fevers, chills, perhaps nausea and vomiting, and marked mental anguish. Cystoscopy may be negative, and a catheter passed (if conditions will allow) show little difference in the urine of the two organs. Sometimes a few leucocytes will come down from the urine of the infected organ.

CASE I.—F. H., forty years old, married man of excellent habits and fine physique. In childhood suffered from diphtheria, mumps, and measles. Years ago while in Panama was sick with Chagres fever, leaving a somewhat enlarged spleen. There was no history of gastro-intestinal lesion. He was not a drinker. There was no history of trauma.

While feeling perfectly well, with mental and physical content, was taken with pains in the upper left abdomen, in the evening of January 20, 1912.

On the twenty-first, colicky pains continued.

On the twenty-second, seen by Dr. G. A. Krauss, who gave some medical treatment, relieving him for four hours.

On Tuesday, the twenty-third, the family physician, Dr. F. E. Lambert, was called on account of the severe continuous pains in the left loin. Further relief was obtained by medication. Not at this time nor subsequently did the pain extend into the genitalia. Reported to have had two chills, each of ten minutes' duration, one in the morning, one in the afternoon.

On Wednesday, the twenty-fourth, not being any better and suffering severely, was referred to Christ Hospital, reaching there at 8 P.M. Rectal temperature was 105°; pulse 108; condition fair, but was writhing in agony, with pain in the left upper quadrant. Pain was of colicky nature and extended down to the brim of the pelvis. There was no increased frequency of micturition. Palpation elicited extreme tenderness in the costo-vertebral angle on the left side, also anteriorly. In addition there was general abdominal tenderness.

His condition did not permit of cystoscopy. Urine was acid; normal in amount. In spite of morphine administered hypodermically little relief was obtained. Time was spent in differentiating between descending calculus, associated with some pyelitis and renal infarct. The latter was thought of because of Brewer's paper and experiments. *Urinalysis:* specific gravity 1025; no sugar; trace of albumin; occasional hyaline cast and few white blood-cells. *Examination of fæces* for blood, negative. *Blood count:* white cells, 19,000; 83 per cent. polynuclears.

On January 26, chill, at 10.30 A.M. At 11.20 A.M. he passed a worm-like cast of ureter. Unfortunately this was lost, although referred to the pathologist.

It was now decided that further delay was not wise, and at

3.30 P.M. of the twenty-sixth, under ether anæsthesia, the loin was opened through an incision running parallel to the twelfth rib. There was two inches of fat to muscle and aponeuroses. The muscles were thick, firm, and well developed. The deep fat as well as the perirenal was œdematous and broke away easily. The kidney was enormously swollen, capsule tense, shiny, and of a deep purple color; uniform in appearance. It could not be measured, but its estimated length was 17 to 20 cm. and it was fully 12 cm. broad. A trochar was plunged into the pelvis. There was no discharge; the finger was pushed in and no calculi discovered. After exploration there was a free gush of blood. Patient's temperature at the time of operation having dropped to 101°, his pulse also falling, and with the recollection of good results obtained by some surgeons through drainage, such was instituted. After the operation he was relieved of his colicky pain, but for it was substituted a severe soreness.

In the evening of the same day his temperature and pulse commenced to rise and he died the following night, on January 27.

An autopsy was permitted and the kidney referred to Dr. G. E. McLaughlin, chief of the laboratory, who made the following report:

"The right kidney showed a mild parenchymatous nephritis; the left kidney, severe parenchymatous nephritis with very small multiple abscesses scattered throughout, and septic infarct at its upper pole. There was a moderate pyelitis. Cultures made from these multiple abscesses gave pure growths of *Bacillus coli communis,* which were decidedly virulent. This case was undoubtedly one of hæmatogenous infection."

The clinical history of this unique case, in perspective, when taken as a whole, clearly indicates that the proper procedure would have been a cœliotomy with removal of the kidney immediately on the arrival of the patient at the hospital. One's personal experience in conditions so rare is a poor guide to treatment. The dissertations in our literature on acute kidneys and infarcts are not sufficiently reiterated to produce a strong mental impression, and this recital is given in the hope that other surgeons in a similar predicament may profit by this case.

ACUTE UNILATERAL INFECTION OF THE KIDNEY.

BY F. W. RINKENBERGER, M.D.,
OF TACOMA, WASH.

FROM reading the article by Dr. F. J. Cotton in the ANNALS OF SURGERY for November, 1911, I am impelled to report a case and make some observations upon this subject, which certainly has not received the attention it deserves.

Descriptions have only lately begun to appear in the text-books, and such works as Johnson's "Surgical Diagnosis," Brewer's and Mumford's monographs on surgery, Watson and Cunningham on genito-urinary diseases contain articles, while most of the other late American and the foreign works either do not describe the condition or else do so in a faulty manner.

Brewer and Cobb were the pioneers in working out the disease as an entity, and Cobb's article in the ANNALS OF SURGERY for November, 1908, is probably the best exposition of the subject to be found.

Following is a report of my case:

Mrs. A. T., aged 24, I-para and a housewife by occupation. Family and personal history negative. Was first seen on the morning of December 30, 1908, when the following conditions presented themselves: The patient had been seized with a severe pain in the abdomen at about 4 A.M.; there was slight nausea and a great deal of pain over the abdomen but no localized tenderness. The temperature was in the neighborhood of 103° and the pulse 120. As it was impossible to make an absolute diagnosis, the patient was placed in the Fowler position and an ice-bag applied to the abdomen. All food was withheld. Removal to a hospital was advised and refused. During the day the condition was much the same and there was no remission of temperature the next morning. During the second day (December 31) the condition was still much the same, except that the patient was

all the time growing more septic. At 7 o'clock that night the patient consented to be removed to the hospital, and was admitted there with a temperature of 103° and a pulse of 140. The leucocyte count was 18,000. The temperature rose steadily during the night, and at noon of the third day (January 1) was 104.4°. The patient began menstruating on this day, and I was able to elicit marked tenderness in the right costovertebral angle for the first time. The condition was distinctly bad, with a high temperature and a falling leucocyte count and a very septic appearance of the facies. At eight o'clock that night the patient was taken to the operating room, and so certain was I by this time of my diagnosis that the incision was made directly over the kidney and the organ delivered. As soon as the kidney was seen a nephrectomy was determined upon and performed, a gutta-percha drain being left in the wound. The patient was on the table less than 50 minutes and was returned to bed without shock. At eight o'clock the next morning the temperature had fallen to 99°. Convalescence was uneventful, and the patient left the hospital on the fourteenth day. I examined her urine 18 months and two and a half years following the operation and it was normal in quantity and character.

The importance of this condition lies in the difficulty experienced in its diagnosis. That difficulty militates against the early institution of proper treatment, which is usually nephrectomy. Failing the proper treatment, many of these cases must of necessity result fatally.

The condition is one of early adult life and is much more common in women and apparently in those who have borne children. It is particularly liable to be mistaken for appendicitis, cholecystitis, peritonitis, or some other common intra-abdominal emergency. In many of the earlier cases, when the disease was just beginning to be recognized, the patients were mostly operated upon under a mistaken diagnosis, and the true state of affairs was only recognized when the abdomen had been opened. In fact Cobb goes so far as to say that in some acute fulminating cases it may be impossible to make the diagnosis without an exploratory opening.

The onset is usually very acute, and a peculiar feature

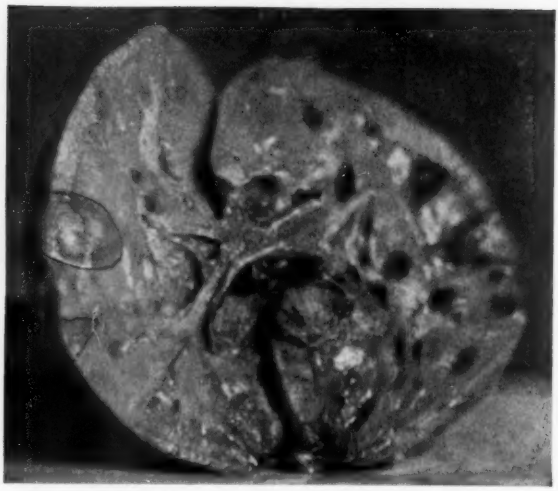
FIG. 1.

Anterior surface; acute unilateral kidney infection.

FIG. 2.

Posterior surface; acute unilateral kidney infection.

FIG. 3.



Kidney split; acute unilateral kidney infection.

is that it occurs in persons who just before had been apparently entirely well. There may or may not be a chill, and there is usually a great deal of pain which may be generalized over the whole abdomen or localized on one side.

The temperature ranges much higher than is common in the other intra-abdominal emergencies, and nausea and vomiting are not such prominent features as is usual in acute appendicitis. This, while only relative, should cause one to think of some other condition than acute appendicitis, for it is with the latter that acute kidney infection will be most frequently confounded.

The one constant symptom is costovertebral tenderness, and from what I can find in the literature it has been present in all the cases in which it was sought. The urine may show some changes but I do not believe this is constant. Brewer holds that there are changes in all cases but Cobb does not agree with him. In my own case, while the patient was not cystoscoped, there was no appreciable change either chemically or microscopically. It is logical to suppose that when there are changes present they would be those which Brewer has described, namely, a diminution in the amount on the affected side as well as the appearance of red cells, and later if the patient survived long enough pus should be present.

We have then as a basis for diagnosis the following points, namely, an extremely sick patient who a short time before was apparently well and who will show a high temperature, rapid pulse and respiration, high leucocyte count, tenderness probably over the whole abdomen and certainly over the costovertebral angle, and possibly some urinary changes. This is a description which will show the difficulty of differentiation from other intra-abdominal emergencies, and I am sure will test the diagnostic acumen of the best.

The pathology of the condition is simply that of an infarct which has added to its ordinary gravity the extremely dangerous complication of being highly infective. The specimen will therefore show the regular wedge-shaped lesions

under the capsule and corresponding to the position of the end arteries. The gross appearance (as is beautifully shown in my specimen) will show the dark areas just under the capsule. A section will demonstrate their wedge shape. Later these areas may and probably will become purulent, and in some cases the entire kidney may become a pus sac. The infecting organism in the great majority of cases is the colon bacillus.

From Dr. Cotton's description of the pathology in his cases I am somewhat doubtful of their being typical examples of the condition under discussion. His description does not correspond to the reported cases and to my own case. He reports small whitish areas under the capsule, while the photographs of Dr. Cobb's cases and my own show large dark purple areas. As to mobility being a prominent etiological factor, it was not present in my case and I have not seen this feature commented upon before.

The treatment is essentially surgical and in most cases will offer the best hope of success if nephrectomy is performed. If there are only one or two areas of infection and it seems possible to reach all the pathology, it will probably be better in some cases to split the capsule and drain. However, in some of the reported cases in which this course was pursued, it became necessary later to do a secondary nephrectomy and with vastly increased difficulty. If there is doubt as to the functional capacity of the other kidney it is safer not to perform a primary nephrectomy.

ADHERENT HERNIAS OF THE LARGE INTESTINE.

BY J. LOUIS RANSOHOFF, M.D.,
OF CINCINNATI.

SLIDING hernia of the sigmoid is a subject which as a rule does not receive the attention it merits. In most text-books on surgery, even in some of the treatises on hernia, it is barely mentioned. Though uncommon, it is one of the most important forms of hernia, its importance lying in its recognition during operation. If unrecognized, proper operative steps cannot be instituted, and the viability of the bowel may be jeopardized.

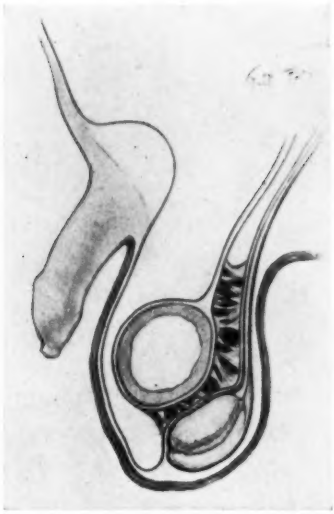
Since the first accurate description by Scarpa in 1812, it has been variously known as adherent hernia of the large intestine, hernia with incomplete sac or sliding hernia, the *hernie par glissmente* of French authors. As I hope to show, the only proper designation is adherent hernia of the large intestine, the other terms being misnomers, based on faulty conception of pathogenesis.

The most widely accepted theory is that this form of hernia occurs by the sliding of the gut on the posterior peritoneum. Before going further it is essential to describe the appearance of the unreduced hernia in the opened sac. The contents of the sac are either cæcum and ascending colon in right hernias, or ileopelvic colon (commonly called sigmoid) in left hernias; very rarely the transverse colon. The sac, well formed and complete on its anterior aspect, is seemingly deficient behind, the bowel being tightly adherent to, and apparently incorporated in, the posterior wall of the sac; hence the designation, hernia with incomplete sac. Fig. 1 shows this condition in sagittal section, Fig. 2 in cross section. If the incision in the sac is carried through the internal ring into the abdominal cavity, it will be seen that the adhesions of the gut to the posterior surface of the sac are continuous with the mesosigmoid, or with the normal reflection of the

peritoneum from the bowel to the posterior abdominal wall. An attempt to reduce the bowel will be unsuccessful until it is separated from the posterior wall of the sac by sharp dissection or without reducing sac and gut together. Above all, it is noteworthy that the adhesions between gut and sac wall show no evidence of being inflammatory, but resemble what they really are, the usual adhesions of the large intestine to the posterior peritoneum (Fig. 7).

Pathogenesis.—In attempting to elucidate the various theories, I shall speak principally of adherent hernia of the sigmoid, as what pertains to hernias of the sigmoid on the left side may be applied to hernias of the cæcum on the right. I shall first consider the commonly accepted theory, that these hernias are due to the sliding of the posterior peritoneum on the underlying cellular tissue, the peritoneum sliding into the internal ring, carrying with it the attached loop of large bowel. This theory appears untenable, and rightly so, as it is based upon unsound mechanical principles. The iliopelvic colon or sigmoid is, in part, normally attached to the posterior peritoneum at the level of the left sacro-iliac synchondrosis, by a broad fold of peritoneum, which appears deficient on the posterior aspect of the gut. That is, the posterior surface of the bowel is apparently in direct contact with the retroperitoneal cellular tissue of the ileopelvic fossa. In a certain number of cases, however, the attachment of the ileopelvic colon lies at a lower level and the anterior leaf of its peritoneal covering is reflected to the anterior abdominal wall, just above Poupart's ligament, the posterior leaf to the posterior abdominal wall just above the internal ring. This brings the posterior uncovered surface of the bowel in direct contact with the internal ring, also uncovered by peritoneum, as its peritoneal covering has been dislocated to the anterior abdominal wall. Any sudden increase in intra-abdominal pressure or prolonged increase, as due to straining at stool, is sufficient to force the knuckle of bowel through the unprotected ring and into the canal. The continuance of pressure forces the gut, dragging the peritoneum behind it, further

FIG. 1.

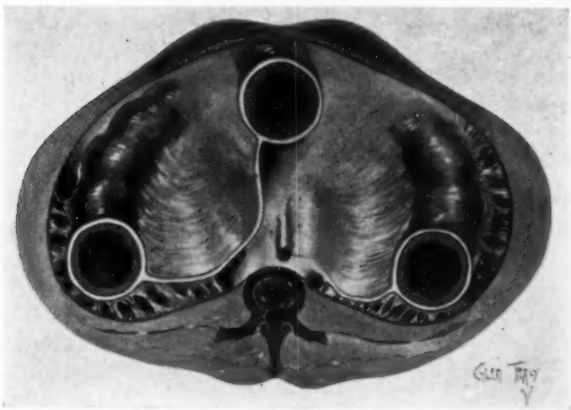


Sagittal section of adherent hernia of large intestine, showing adhesions between mesentery, gut and posterior wall of sac.

FIG. 2.

Cross section of large intestine, showing adhesions between mesentery, gut and sac wall, with nutrient vessels in the adherent mesentery.

FIG. 3.



Cross section through abdomen at third lumbar vertebra, looking toward diaphragm, showing mesentery of ascending and descending colon adherent to posterior abdominal wall.

FIG. 4.

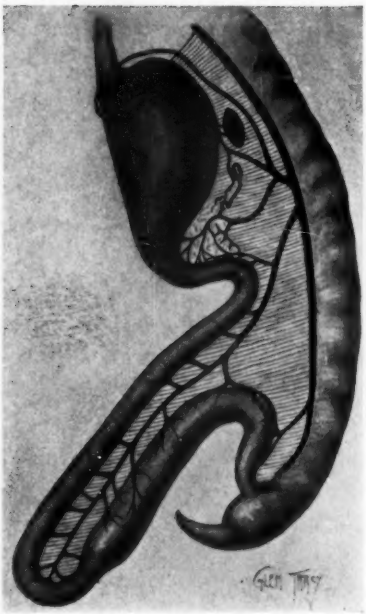


FIG. 5

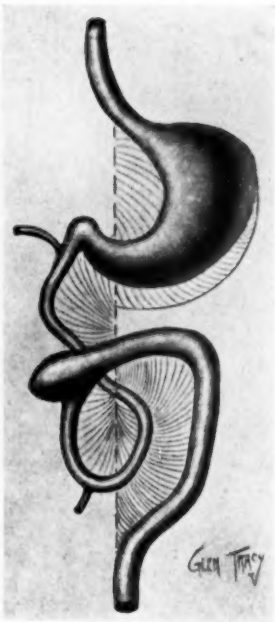


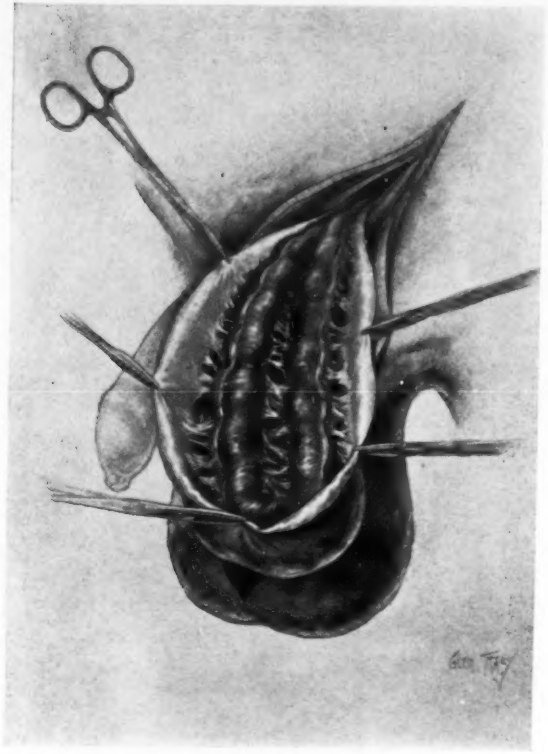
FIG. 4.—Alimentary tract of embryo of 6 weeks, showing rudiments of the two mesenteric systems (after Hertwig).

FIG. 5.—Embryo of 8 weeks, showing large intestine with free mesentery outlining the abdomen.

FIG. 6.

Drawing from cadaver, showing the adherence of the entire ascending and descending colon, the adhesions beginning at the hepatic and splenic flexures.

FIG. 7.



Drawing from life, showing the sigmoid adherent in the opened sac.

FIG. 8.

Showing method of operating on adherent hernia of sigmoid; peritoneal flap prepared for closure of ring; purse-string and continuous suture for formation of new mesentery almost completed.

along the canal into the scrotum. This low position of the sigmoid is supposedly due to the downward dislocation of the peritoneum lining the lower portion of the abdomen. This dislocation is either congenital or has been caused by increased intra-abdominal pressure. It is presumed that the posterior peritoneum has become loosened from its underlying supporting cellular tissue. This theory, accepted by Ranzi, Scarpa, Wier, Stoney, and many others, is utterly fallacious. Even in the opened abdomen, it is no easy task to strip the peritoneum from the abdominal wall, so close is its adherence; in addition to this, any increase in intra-abdominal pressure only serves to apply the parietal peritoneum more closely to the abdominal wall.

If this form of hernia occurred by sliding of the peritoneum on the posterior abdominal wall, there would be a dislocation of the entire posterior peritoneum with the attached gut; whereas, the splenic flexure on the one hand, and the hepatic flexure on the other, are invariably found in their normal anatomical positions. It is true, that Tuffier has reported a case of enormous hernia of the descending colon, where the kidney was dislocated. This, however, was probably due to a dragging of the inferior mesenteric artery on the aorta and the dislocation of the aorta and through it a dislocation of the kidney. Again, if this form of hernia occurred by sliding, there would be from the moment of occurrence difficulty in reduction; whereas, in nearly all cases the history points to the hernia having become irreducible only after months or even years.

But most convincing of all are the few cases in which, without visceral transposition, the cæcum has been found adherent in left-sided hernias and the sigmoid in the right hernias. By the utmost stretch of imagination there can be no discussion on this point; the peritoneum on the left side cannot slide into the right inguinal canal, nor *vice versa*. Furthermore, it is almost axiomatic that the *sine qua non* of the development of a hernia of an intestinal coil is the mobility of that coil. If a loop of intestine is found fixed in

a hernial sac, it is conclusive proof that before the formation of the hernia the loop was mobile. The sigmoid does not rest on the cellular tissue of the posterior abdominal wall, but is separated from it by a triplicate layer of fused peritoneum. First the posterior peritoneum itself, second and third the double layer of adherent mesentery through which the nutrient vessels of the gut pass (Fig. 4). This same relationship exists between the sac wall and the adherent intestinal coil (Figs. 1 and 2). This fused peritoneum, called by the French the *fascia d'accolement,* fixes the attached portion of the sigmoid and cæcum firmly to the posterior abdominal wall, and itself prevents any possibility of sliding or dislocation.

An ingenious, though untenable, theory has been advanced by Lockwood, who claims that before the descent of the testes the right testicle lies in close relationship to the cæcum, the left to the sigmoid flexure. Lockwood supposes that an abnormal adhesion develops between the cæcum or sigmoid on the one hand and the right or left testicle on the other. The testicle in its passage downward through the internal ring pulls on the cæcum or sigmoid, as the case may be, and dislocates it downward to the region of the internal ring, where any slight increase in pressure is sufficient to force the gut into the inguinal canal. The untenability of this theory can be appreciated when it is realized that the extraperitoneal testicle is separated from the gut, not only by the parietal peritoneum, but also by the double fused layer of agglutinated mesocolon. In our many cases of retained testes, we have never encountered any such adhesion. It is just as impossible to picture an adhesion occurring between the kidney and intestine as between the testicle and intestine. However, even granting the possibility that this adhesion might occur, the disproportion in size between the testicle and colon would result not in a descent of the colon, but rather in a retained testicle.

Another theory almost too futile to deserve serious consideration has been advanced by Savariaud. He supposes

that the bowel slips out from its mesentery as a glove finger is everted, passes behind the peritoneum and so on into the ring. Considering that the true length of the colic mesentery, though adherent, extends from the vertebral column to the gut, this theory becomes immediately disqualified (Fig. 3).

It is evident that none of these hypotheses can adequately or satisfactorily explain the condition under consideration. In order to truly understand the pathogenesis of attached hernias of the large intestine, it is essential to consider the embryology of the intestinal tract, its mesenteries, and particularly the secondary changes in the mesentery of the large intestine.

During the fourth week of embryonic life, the alimentary tract stretches as a straight tube from primitive mouth to anus. All but the upper portion is attached behind to the chorda by a straight double mesentery, the layers of which enclose at the base the primitive aorta. The first differentiation of this tube into its separate parts begins with the development of a small spindle-shaped enlargement, the stomach. The rest of the alimentary tube is still connected with the yolk sac. The further alteration in the shape and position of the alimentary tube and its mesenteries is due to the disproportionate lengthening of the tube, that is, disproportionate to the development of the abdominal cavity. Consequently, to find room, the intestinal canal must take a winding and tortuous course.

The stomach is the first portion of the intestinal tract to begin its axial rotation, turning so that the left side becomes the anterior surface and lesser curvature, the right side the posterior surface and greater curvature. This brings the pylorus slightly to the right of the median line, and begins the twisting of the intestine. The twisting of the small intestine takes place about the origin of the superior mesenteric artery, and both it and the large intestine rotate in the direction opposite to that of the hands of a clock.

In an embryo of six weeks the intestinal tract, greatly increased in length, has already formed two distinct loops both running in an anteroposterior direction. In these loops

can be recognized the rudiments of the two mesenteric systems, the great or superior and the lesser or inferior (Fig. 4). From the pylorus the intestinal tube runs directly backward to the vertebral column; from here a sharp bend downward and forward toward the umbilicus; from the umbilicus back to the vertebral column and then straight on to the rectum. The upper loop consists of two nearly parallel arms connected to the vertebral column by a sagittal mesentery, in which runs the first evidence of the superior mesenteric artery. At the apex of the loop is the now occluded viteline duct. A little further toward the caudal end of the embryo is found a slight enlargement, the beginning of the large intestine. At this stage the lesser or inferior mesenteric system can also be distinguished near the caudal end of the embryo. During the third month further changes occur in the size and position of the stomach. As these changes, however, are not germane to the subject under consideration, it suffices to say that the twisting of the stomach and its mesentery results in the formation of the bursa omentalis. The changes in the small and large intestine, particularly the variations in the relation of their mesenteries, are of paramount importance to the comprehensive exposition of hernias of the large intestine. The duodenum is the only portion of the small intestine which retains its early embryonic position. It is attached to the vertebral column by a short mesentery, which early fuses with the parietal peritoneum, thus permanently fixing the duodenum in place.

The increase in length of small intestine is accommodated by the folding of its mesentery in a frill shape, the base narrow and the outer edge of great length. The most important change, however, takes place in the position of the large intestine and its mesentery. This fact must always be borne in mind; the large intestine at all times possesses a long mesentery and is at no stage or in no part extraperitoneal (Fig. 3). The cæcum is at this stage rotated across the abdomen from below upward and from right to left and again to the right, until it occupies a position under the liver.

This ascending loop, which later forms the entire large intestine, thus crosses the loop of small intestine from below upward and from right to left, crossing at the duodenum, carrying its mesentery with it. This explains why the duodenum is buried under the transverse mesocolon (Fig. 5). The cæcum, in the adult sense of the word, is not yet developed, as it is not an integral part of the embryonic large intestine, but a pouching or evagination of its wall. The transverse colon as in adult life crosses the duodenum to the splenic flexure and from there on the descending colon to the rectum. In later embryonic life the cæcum descends toward the right pelvis, forming the ascending colon.

This description has been undertaken to show that the entire large intestine has a distinct mesentery and lies free in the abdominal cavity. The large intestine forms a horseshoe, outlining the confines of the peritoneal cavity. Grouped in the centre are the small intestines (Fig. 5). The secondary adhesions, which now form, change the mobile fetal large intestine into the fixed adult type.

Peritoneal surfaces have a tendency to adhere when they are held in contact under pressure. The small intestine, and particularly its mesentery, does not adhere to the parietal peritoneum, for two reasons: (1) from the time of the development of the liver in the fifth week, the small intestines are filled with its secretion, and in a state of active peristalsis; (2) its frilled mesentery presents no broad surface for agglutination.

The conditions in the large intestine and its mesentery are the reverse.

(1) The broad flat mesentery stretching on either side from the vertebral column to the large gut rests directly on the posterior parietal peritoneum (Fig. 4). Moreover as the large bowel is empty and not in active peristalsis, it is immobile.

(2) The mesentery is held in contact to the posterior parietal peritoneum not only by the pressure of the filled moving small intestines, but also by intra-abdominal pressure.

(3) Still another feature is the increase in local pressure at the site of the projecting kidneys and adrenals, which force the parietal peritoneum in direct contact with the ascending and descending colon.

The adhesion of mesentery always precedes the adhesion of the bowel; that is, the adhesions begin at the root of the mesenteries and spread toward bowel. Failure of the adhesions to be continuous results in the ileocæcal fossa on the right side, the parasigmoid on the left (Fig. 3).

The agglutination of the large intestine begins at the transverse mesocolon, which adheres to the great bursa. The transverse colon, however, retains its mobility by the mobility of the bursa itself. According to Browman, the limits of adherence of the ascending and descending colons depend entirely on the retroperitoneal position of the kidney and adrenals. Only those portions of the colon lying directly on the anterior surface of the kidney and adrenals adhere, which accounts for the comparative mobility of the cæcum and ileopelvic colon, both of which lie below the level of the kidney. This explanation of the mobility of the cæcum and pelvic colon, while very plausible, does not explain those cases in which the entire descending and ileopelvic colon is found adherent to the posterior peritoneal wall (Fig. 6). The theory, which seems more plausible, is that advanced by Lardennois, that the secondary adhesions of the large intestine begin at two points: on the right side at the hepatic flexure, at the entrance into the mesentery of the highest branch of the right colic branch of the superior mesenteric artery (Fig. 6); on the left side at the splenic flexure, where the highest branch of the inferior mesenteric artery first enters the descending mesocolon, this adhesion being continuous with the phrenocolic ligament. It is interesting to state here that no matter how great the ptosis or dislocation of the colon, the hepatic and splenic flexures are invariably found in their fixed positions. Beginning at the hepatic flexure on the right side the mesentery of the ascending colon adheres along its entire length, the adhesions increasing in extent as

the head of the colon descends. The adhesions begin at the inner border of the mesentery and spread toward the periphery. The cæcum being a pouching of the head of the large bowel has no mesentery and, therefore, does not adhere. The extent of mobility of the cæcum depends entirely on its length; a short cæcum being only slightly mobile will never be found in a hernial sac, while a long, freely movable cæcum has almost the same opportunity of entering the hernial sac as a coil of small intestine. This comparative mobility of the cæcum is often observed during operation in the appendix region. Every operator realizes how simple it is in some cases to deliver the cæcum through a gridiron incision and how difficult in others. The adhesion of the descending colon begins at the splenic flexure and passes progressively downward along the whole course of the posterior abdominal wall to the brim of the pelvis.

It is necessary at this point to consider the measurements of the different parts of the colon. The left colon is arbitrarily divided into the descending and ileopelvic portions. The length of the descending colon is fairly constant, measuring about 14 cm. The ileopelvic portion on the other hand varies within the enormous limits of 14–81 cm. Evidently the longer the colon the greater will be its motility, as only that portion will adhere which comes into direct contact with the posterior peritoneum. An extremely long ileopelvic colon partakes of the nature of the small intestine, and for this reason has the same chance of entering the hernial sac. A short colon stretched from the splenic flexure to the rectum would be adherent along its entire length (Fig. 6), and this brings out the crucial point, it could not possibly become engaged in a hernia.

What is the cause of the adherence of the large intestine, when it finally gains access to the hernial sac? Its early reducibility is sufficient proof, that in the beginning it is non-adherent. The reason for its adherence is that under resumed embryonal conditions it follows its embryonal tendencies. In the hernial sac, the broad flat mesentery of the large intestine

comes into direct contact with the peritoneal surface of the sac. Moreover, the two peritoneal surfaces are held in contact under considerable pressure, as the large intestine, particularly by pelvic colon, is usually distended with fæces. Beside, the large intestine, unlike the small intestine, is comparatively immobile and seldom in a state of active peristalsis. Thus we have the requisites for peritoneal agglutination present: (1) broad flat surfaces held in contact under pressure; (2) comparative immobility.

As in embryonic life, the adhesions begin behind, at the attachment of the mesentery, and progress steadily around the sac (Figs. 1, 2, and 7). There are cases reported of so-called hernias without sacs, where the entire sac has been obliterated by these adhesions.

To recapitulate: After studying the embryology of the large intestine and the secondary adhesions of its mesenteries, the following conclusions may safely be drawn:

1. So-called hernias with incomplete sacs do not exist, except as a secondary process.

2. The sac is complete in its incipiency and has been obliterated by secondary adhesions of the embryonal type.

3. A loop of intestine found in a hernial sac is conclusive proof that originally that loop was mobile.

4. In adherent hernias of the large intestine the hernia is primary, the adhesions secondary.

5. The crux of the situation is the redundant colonic loop.

Morphologically, three forms of hernia of the large intestine may be distinguished, the varieties based on the relationship of contents to sac:

1. The sac is complete. That is, there are no adhesions between the sac wall and gut. This form differs in no wise from the ordinary reducible hernias of the small intestine. The loop of the bowel and its mesentery are easily reduced. This form of hernia occurs when from an early stage in its existence the hernia has been kept in place by a truss, and no chance has been given for the formation of adhesions.

2. The most common form of hernia of the large intestine

is that with partial obliteration of the sac by secondary adhesions, the so-called hernia with incomplete sac (Figs. 1, 2, and 7). The posterior portion of the sac has become obliterated by adhesions beginning at the mesentery behind and extending to a variable distance around the sac. The entire loop of bowel is usually found adherent, beginning below at the base of the sac and extending to the neck. When the cæcum and appendix are engaged in a hernia, the adhesion begins at the broad flat mesentery of the head of the colon and the first loop of the ileum.

3. Hernia with complete obliteration of the sac, the so-called sacless hernia, is extremely rare and very few cases have been reported. There is some doubt whether this form of hernia really exists, and whether some portion of the sac, however small, is not always preserved.

These adherent hernias of the large intestine are seldom strangulated, probably due to the large size of the ring, which has been enlarged by the thick-walled large bowel and its semi-solid contents. On the other hand, inflammation and the presence of fibrinous exudates in the sac are not of unusual occurrence, as in Case I. This is perhaps due to an injury of the irreducible gut, and the migration through its wall of bacteria.

On opening the sac by a hernia-laparotomy incision, it is found that the adhesions of the gut to the posterior surface of the sac are continuous with the mesosigmoid, or with the normal reflexion of the peritoneum to the posterior abdominal wall. The gut is continuous with the pelvic colon or with the ascending colon as the case may be. The adhesions are so dense that it seems as though the sac is really deficient behind. What is most important is the fact that the nutrient vessels of the bowel are found in the adhesions. An attempt to separate these adhesions by blunt dissection is unsuccessful. The anterior part of the sac is free, the posterior wall is formed by the loop of gut, which seems to be really incorporated in the wall of the sac, the peritoneum of the sac appearing to be continuous with the covering of the bowel (Fig. 7). There

are frequently other contents of these hernial sacs. On the right side the first coil of ileum with its mesentery may be found adherent in the sac, on the right or left side free coils of small intestine. Unless strangulated, the small bowel is easily reduced, leaving the hernial sac with the large bowel attached to its wall. In some instances the adhesions may be so dense as to include the extraperitoneal testicle and cord. Cases have been reported in which the testicle was so adherent that it was necessary to sacrifice it before radically curing the hernia. This, however, seems in the majority of cases unjustifiable.

Symptomatology.—Though the symptoms of these hernias are not in any way distinctive, there are certain suggestive features which point to the possibility of a diagnosis being made. Usually occurring in males, these hernias come on after adult life. At first reducible, they become irreducible after months or sometimes years. If sigmoid hernias, they have a doughy feeling and cause their bearer less discomfort after a thorough evacuation of the bowels. If a hernia of this sort is suspected, the diagnosis could easily be made by the injection of bismuth per rectum, followed by a radiogram. It is during operation that the diagnosis can and must be made, as only by precisely understanding the condition present can proper treatment be instituted. After exposure and isolation of the sac in a radical herniotomy, it is the practice of many surgeons to attempt to reduce the contents before opening the sac. If this manœuvre is unsuccessful, an immediate suspicion of adherent hernia should be aroused, and the greatest precautions taken to obviate injury to the bowel. The sac should be palpated with the gloved finger and a non-adherent portion found, which is invariably in the anterior portion of the sac. Grasping this non-adherent portion of the sac with forceps, it is lifted free from the underlying contents and opened by a small incision. The opening is enlarged upward toward the neck of the sac preceding the incision, with the finger or grooved director. In extending the opening of the sac downward, it is well to exert great care not to injure the cross loop of the bowel. After freely opening the sac.

if this form of hernia is borne in mind, the diagnosis can surely be made. If a gentle attempt is made to separate these adhesions, it will be found unsuccessful without using undue force. In fact any attempt to separate these adhesions is unjustifiable and may result in disaster.

Treatment.—According to Weir, Heydenreich attempted this manœuvre in two cases, both followed by fecal fistula and recurrence of the hernia. Numerous like disasters have been reported. Fearing a similar result, Jaboulay resected the entire adherent loop of bowel.

No matter what method of treatment is followed, it is essential that the neck of the sac should be well exposed. To accomplish this exposure, it is frequently necessary to perform a hernia-laparotomy. This is done by introducing the finger through the internal ring and cutting the internal oblique to a variable extent above the ring. After this is done, one of several methods of treatment may be instituted. Savariaud's method is in fact a reduction of the sac and bowel *en masse*. This method was practised in Cases I and II. In order to thoroughly complete this operation, the sac and its contents must be well exposed above the internal ring, which must be stretched sufficiently wide to permit the passage of the sac and its contents without using undue force. In his original description of the operation, Savariaud advised the closure of the incision in the sac wall before reduction is attempted. The sac and its contents are then forced through the internal ring as though inverting a gloved finger. The ring is closed by bringing the edges of the inverted sac in apposition by interrupted sutures. The operation is completed as an ordinary herniotomy.

The disadvantages of this operation are the insecurity of the closure of the ring and the danger which always attends the reduction of a hernia *en masse*. That is, there is a possibility of later strangulation within the reduced sac. The operative procedure followed in Case III, which is a slight modification of a method described by Hotchkiss in 1910, seems to offer greater advantages in that it results in a return

to fairly normal anatomical relations. After division and thorough exposure of the sac (Fig. 7) it will, as a rule, be seen that one side of the sac is of greater width than the other. In this event the more ample peritoneal surface is chosen as a flap to cover the ring. In case the peritoneal surfaces are of almost equal extent the mesial portion of the sac should be utilized for this purpose.

The portion of the sac chosen as a covering for the ring is separated by an incision beginning at the bottom of the sac and running parallel to and at least one inch from the gut wall. The flap is completely freed below, left attached above to the peritoneum covering the internal aspect of the ring (Fig. 8). The loop of bowel is now pulled out well through the ring and reflected on the abdomen. The attached flaps of the sac are now united on the posterior surface of the bowel by a fine running catgut suture, thus forming a new mesocolon. The suture is begun above at the cross loop of the bowel by using a wide purse-string suture so as to prevent angulation. After the continuous suture is completed, the loop of bowel is easily reduced. The ring is closed by suturing the prepared flap of peritoneum to the peritoneum covering the internal ring. The margins of the internal oblique, if divided, are exactly approximated, and the operation completed after the Bassini method. Lardonnois and Okinji suggested that as these hernias are due to the mobility of the large intestine, they should be treated by fixing the intestine to the posterior peritoneal wall. After exposing the sac, the neck is well exposed by a hernia-laparotomy and the gut carefully dissected from the sac. The loop of large intestine is then sutured as high as possible to the posterior peritoneal wall as in colopexy. In extreme cases it might be well to combine this procedure with the method of operation described above. In a class of cases presenting so many difficulties, probably no one method of treatment will be applicable to all cases, and a combination of two methods may occasionally be of advantage.

The following cases are from the records of Dr. Joseph Ransohoff and the writer:

CASE I.—U. L., aged fifty-four, complained of left inguinal hernia, which had been present for many years, but had only become irreducible during past two years. Examination revealed a left irreducible inguinal hernia, the size of an orange.

Operation (Jewish Hospital, March 7, 1908).—Gas-ether anæsthesia. After opening the sac the descending colon was found adherent to its posterior wall. The gut and sac were reduced *en masse*, and the ring closed by suture. The operation was completed as a typical Bassini. The recovery was uncomplicated and there has been no recurrence.

CASE II.—A. L., aged fifty-three, had had a hernia for two years, which became irreducible during the last two months. During past two days the hernia was swollen, tender and painful. Examination revealed a tense irreducible left inguinal hernia, the size of two fists.

Operation (Jewish Hospital, May 13, 1909).—Gas-ether anæsthesia. After exposing the sac in the usual way, incision into it revealed the inflamed and thickened sigmoid loop adherent to the posterior wall of the sac. Gut and sac were reduced *en masse* and the ring closed by the suture of the inverted sac wall. The operation was completed as a typical Bassini. Recovery was uneventful, and there has been no recurrence.

CASE III.—D. B., aged fifty-nine, had an irreducible inguinal hernia, which had been present for twenty years. During past three years hernia had become irreducible. Examination revealed a very corpulent man with a large, irreducible, left inguinal hernia.

Operation (Jewish Hospital, July 29, 1911).—Gas-oxygen-ether anæsthesia. After exposing the sac in the usual way, an attempt to reduce its contents before opening was unsuccessful. On opening the anterior part of the sac, a loop of the sigmoid about ten inches long was found adherent to its posterior wall. The neck of the sac was exposed by incising the internal oblique. A peritoneal flap for the closure of the ring was made as described above. The two attached portions of the sac were united over the posterior surface of the gut by a running catgut suture. The gut with its new formed mesentery was easily reduced and the ring closed by suturing the prepared flap to the margins of the ring by interrupted catgut sutures. After carefully approximating the cut margins of the internal oblique, the operation was completed as a typical Bassini. Recovery was uneventful, and there has been no recurrence.

AN APPARATUS FOR INTRATRACHEAL INSUFFLATION.

(From the Laboratory for Surgical Research, Columbia University.)

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THE accompanying photographs represent an apparatus for the administration of anæsthesia by intratracheal insufflation. It embodies a number of ideas applied to intratracheal insufflation which have been the outgrowth of the previous work of Dr. Nathan Green and the writer in experimental intrathoracic surgery.

The apparatus furnishes to the patient a continuous current of warmed, moistened, and filtered air, mixed with any desired amount of ether vapor, and interrupted at regular intervals, in order to allow at such intervals of partial collapse of the lungs. At the present time the advantages of such a method of anæsthetization by intratracheal insufflation are abundantly substantiated. The apparatus is easily portable, measures only 18″ × 8″ and will run upon both the alternating and direct current.

The current of air is supplied by the rotary blower "1." This blower is of the simplest type and is in no way dependent upon the use of springs. From the blower the air passes through the filter "2" and from here through the valve "3" over the surface of the ether in the jar "4." After passing over the surface of the ether the current of air passes over the surface of the heated water in the jar "5." The water in this jar is kept at a constant temperature by an electric heater inside. By means of the valve "3" any proportion of the air current may be shunted directly over the heated water in jar "5," thus diminishing reciprocally the amount which passes over the surface of the ether, and in this manner the

FIG. 1.

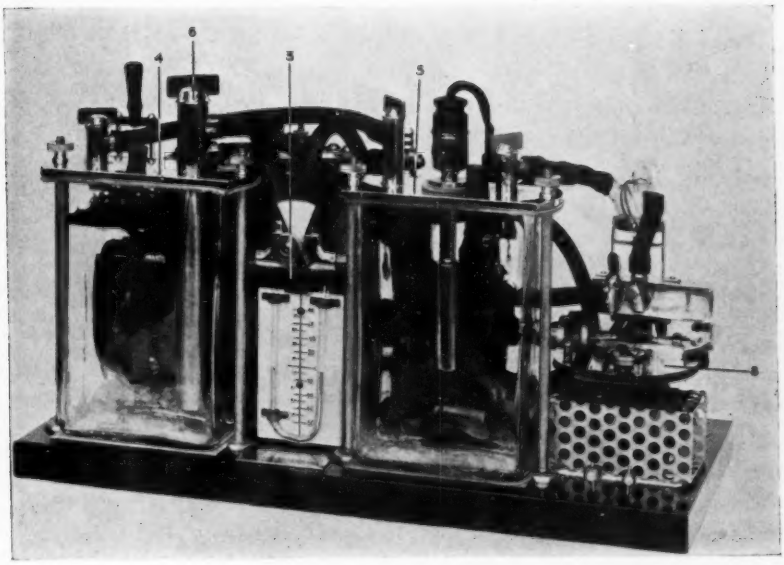

FIG. 2.

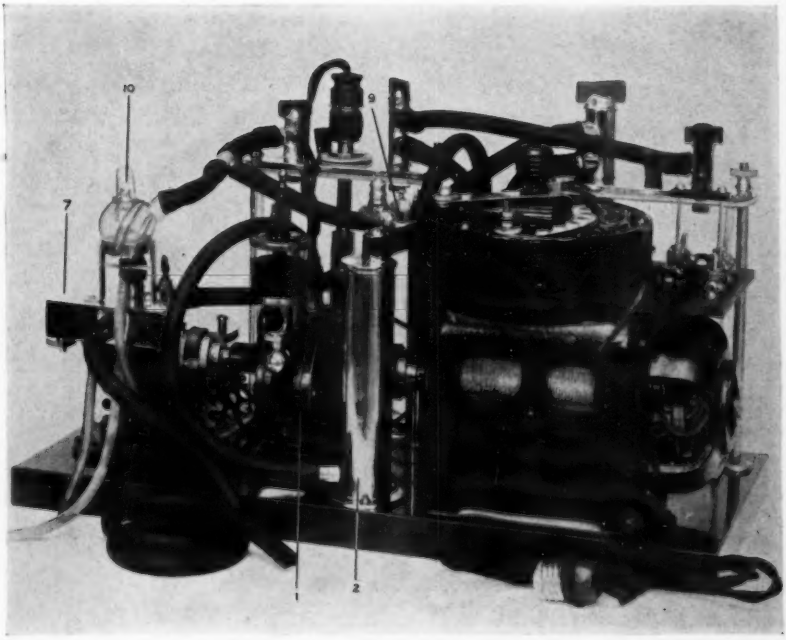

FIG 1.—Front view. 3, valve for regulating the amount of air passed over the surface of the ether; 4, ether jar; 5, water jar; 6, valve for bubbling a portion of the air through the top layers of the ether; 8, worm wheel operating interrupting valve.

FIG. 2.—Back view. 1, blower; 2, air filter and muffler; 7, interrupting valve; 9, safety-valve controlling the pressure; 10, condensing bulb.

amount of ether supplied to the patient. In case a greater quantity of ether is desired at any time, provision is also made by the valve "6" for bubbling a proportion of the air passing through the ether jar through the top layers of the ether irrespective of the level of the ether in the jar.

The current of air passing to the patient is interrupted at regular intervals (which can be varied) by the valve "7," operated in turn by the worm wheel "8." These interruptions are a very important part of intratracheal insufflation. Not only do they materially aid the diffusion of oxygen to the alveoli of the lungs, but they also bear a direct relation to character of the circulation by facilitating the return of the venous blood to the heart. A positive pressure maintained by a constantly distended lung around the great veins entering the heart impedes the venous flow to the heart, and, if high enough, can actually create a mechanically caused shock. For this reason as well as for safe-guarding against rupture of the lungs, the proper regulation of the pressure in intratracheal insufflation is very necessary. An accidental momentary increase of the pressure during intratracheal insufflation may cause rupture of the lungs and fatal pneumothorax with emphysema. With a medium sized catheter within the trachea and a free outlet of the air through the larynx it is difficult to realize how a pressure within the trachea sufficiently high to rupture the lungs could ever occur.

During such acts as coughing the intrapleural pressures often reach 80 to 116 mm. of mercury. The elastic recoil of the lungs after death has been estimated by Hutchinson at 4.23 mm.Hg. To overcome this pressure it is only necessary to supply air through the usual intratracheal catheter at a pressure of 20 mm. of Hg. At this pressure the intratracheal pressure is about 5 mm. of Hg. Even without a manometer to guide one, and much less with one, at first it had been considered safe to trust alone to the degree of distention of the lungs as a guide to the amount of air to be supplied to the patient. Experience, however, has proved this not to be so. Sudden accidental rises in the pressure

may occur. If the tube has not been introduced within the trachea carefully under the guide of direct vision, the latter may be so irritated that it will tightly close around the catheter, causing a sudden increase of pressure. In our own experience a death has resulted from the anæsthetist's pushing the intratracheal tube so far within the trachea that its distal end entered one bronchus. The bronchus tightly hugged the tube, with the result that all the air was blown into one lung with no way of escape. The lung was ruptured, and fatal pneumothorax and emphysema resulted. Such experiences as these demonstrate the necessity not only of carefully supervising the pressure by a manometer, but also the adoption of some means of providing automatically guarding against too great an increase of pressure.

Since the above mentioned experience we have added the blow-off valve "9" which can be adjusted to blow off at 20 or 25 mm. of Hg. The bulb "10" removes the water of condensation from the efferent current of air while the efferent tubes are becoming warmed. We have also added recently a pressure reducer to the blower which permits of the use of very small quantities of air and consequently the saving of ether without the hissing noise incidental to the blow-off valve. Its utilization is of service when ether is given by intratracheal insufflation in other cases than thoracic ones. While intratracheal insufflation may be given with a very simple apparatus depending upon a hand or foot bellows for the supply of air, we believe that the facilities and safeguards of the apparatus herein described insure greater ease and security of administration. A foot bellows should always be at hand in case of accident to the electric current. Such a bellows can be attached to the supply pipe from the blower in time of need.

PICRIC ACID AS A SKIN DISINFECTANT.

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IN the ANNALS OF SURGERY, August, 1911, a report was made from this laboratory upon the germicidal and osmotic properties of picric acid. At that time, picric acid solutions had been used in 19 cases in the service of Dr. F. G. Nifong at the Parker Memorial Hospital. The laboratory tests were so pleasing that the action of picric acid as a disinfectant for the skin seemed promising.

Up to the present time the picric acid solutions, in the main 1 per cent. alcoholic solutions, have been used in 78 cases. Commenting upon its use, Dr. Nifong writes me as follows: "During the last year I have used it in practically all of my cases. When a patient can be prepared over night he has the usual shaving and soap and water scrub, with a saturated watery solution of picric acid applied over the field. Before operation he is washed again with soap and water and the alcoholic solution is applied. In cleansing a scalp or sterilizing an infected wound I have found it most efficient and reliable, which is no doubt due to its high germicidal action and its great power of penetrability, as you have shown by your experiments. I have had no case of wound infection since I have used the method. The only objections I have to it is the intense and tenacious staining, and on two occasions when I did not have my wound edges perfectly coapted there were one or two small points of delayed union due to small coagula of serum between the edges of the wound. These coagula were cultured and found to be absolutely sterile. This high power of coagulating serum makes it necessary to make close and perfect approximation of wounds and leave no

pocket of serum which will be coagulated with a very small quantity of the picric acid and hinder union mechanically."

Shortly after the publication of the uses that have been made of the picric acid solutions here, Fontana [1] published his results. The review appearing in the *Journal of the American Medical Association* [2] is as follows: Fontana uses a 1 per cent. alcoholic solution of picric acid for sterilization of the field of operation, and extols its advantages over other methods. It is as effectual, his tests seem to show, as the tincture of iodine method, while it is much more convenient for sterilization of the hands. Both of these do away with the long scrubbing indispensable with other technics, and which is so liable to chill the patient.

The solutions of picric acid can be depended upon as germicidal and are to be recommended for skin disinfection because of this property and the one of penetrability. Picric acid is cheap and efficient, and deserves a prominent place among the substances used for disinfecting the skin before surgical intervention.

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[1] Riforma Medica, xxvii, No. 35, pp. 953–980.

[2] Journal A. M. A., lvii, 19, Oct. 17, 1911, p. 1249.

TRANSACTIONS

OF THE

AMERICAN SURGICAL ASSOCIATION.

Annual Meeting held at Montreal, Canada, May 29, 30, 31, 1912.

The President, ARPAD G. GERSTER, in the Chair.

ADDRESS OF THE PRESIDENT.

NEPHRECTOMY.

THE President, ARPAD G. GERSTER, M.D., of New York, delivered the opening address, on the above subject, for which see page 1.

BLOODLESS OPERATIONS ON THE LIVER.

JOHN R. MCDILL, of Manila, P. I., reported the results of an experimental study of the possibility of excision of maximum amounts of liver tissue, with the usual instruments at hand in any hospital. His method is as follows:

An enterostomy clamp armed with rubber tubing is passed through a one-inch incision just below the ribs in the mid-axillary line into the abdomen; one blade is introduced into the foramen of Winslow about two inches; when the clamp is closed the circulation in the liver can be turned on or off completely or partially as desired.

For the support of the parts after resections of large wedges of liver tissue, a Martin gum bandage passed entirely around the liver is proposed.

The experiments on dogs show that 20 to 30 minutes' complete interruption of circulation is not followed by bad results, and it is thought that in clinical work the circulation can be completely interrupted with safety for from eight to ten minutes. More experimental work, however, will be required to determine the limits of this procedure.

Conclusions.—1. Extensive liver resection for disease is lim-

ited to primary, single, or closely grouped, accessible conditions; size may be no contraindication, unless too near the portal vein or hepatic arteries. In all primary growths observe Tuffier's caution carefully to determine glandular involvement along the vessels at the base of the liver.

2. All procedures can probably with safety be made entirely bloodless for at least eight or ten minutes; by opening and closing the forceps the circulation can be turned partially or entirely on or off to avoid the danger of a too prolonged interruption; this controlled blood stream also favors hæmostasis by slowly filling up cut vessels and stitch wounds with coagula; compresses to cut or wounded surfaces during a re-establishment of circulation would prevent undue loss of blood and allow of ligation or circumstitching of venous channels.

3. Great congestion of the gastro-intestinal branches of the portal system, blueness of the intestines, and subperitoneal ecchymoses while using the clamp indicate a dangerous degree of back pressure. The shorter the time of complete temporary arrest of circulation, the better.

4. The variability of the liver tissue and of degrees of portal pressure should be remembered; a marked chronic portal congestion should contraindicate extensive operations.

5 Traumatic rupture of the liver frequently occurs without any external evidence; owing to structural arrangement, tearing of large vessels may result in continuous hemorrhage which is partially checked by reflex muscular rigidity and intra-abdominal tension; relief of this pressure upon opening an abdomen allows of increased bleeding unless immediate digital compression of the hepatic vessels is effected.

6. In favorable cases liver tissue can be removed to the physiologic limit under practically bloodless conditions.

7. Chloroform is always contraindicated in liver operations on account of the danger of sudden fatty degeneration and of necrosis and hemorrhage, due to the elimination of fibrinogen by the chloroform and inefficient coagulation; because fibrinogen is either formed wholly in the liver or is wholly dependent upon liver activity for its production.

8. The clamp can be left *in situ,* open, to control a possible secondary hemorrhage.

9. The instruments required for any liver surgery are in the usual hospital armamentarium.

LEONARD FREEMAN, of Denver, Col., said that he had found one of the most reliable and simple methods of preventing hemorrhage in resection of the liver to be the use of strips of gauze, made from the ordinary small folded tapes of gauze found in every operating room. A pair of narrow forceps of sufficient length to reach through the liver substance are plunged through the substance of the liver at the margin of the portion to be removed, seize two pieces of gauze and drag them through the hole in the liver; this procedure is repeated until the portion of liver to be removed is completely surrounded by gauze loops. The portion of each loop which lies beneath the liver substance has been cut in two and united with catgut in order to facilitate its removal. When these loops are tied down, not too tightly, the hemorrhage is completely controlled, and the portion of liver can be cut away like a piece of cheese. Another method employed in resecting large portions of the liver for multiple tumors is by the use of two wires forming a wire clamp; this method is particularly applicable to where a more or less detached portion of liver is to be removed. The wires should be stiff and long enough when placed on each side of the tongue or tissue that their edges may project from the abdominal wound, and they can be bent in a gradual curve if necessary. In employing this method three or more catgut loops are dragged through the liver by means of a small pair of alligator forceps, which seize the loops so that the free ends are all on one side; then one of the wires is inserted through the loops upon one side and the ends of the loop are tied over another wire on the other side, the wires then being brought firmly together, clamping the liver substance. At the end of a number of days the wires may be withdrawn, leaving the catgut loops in place to dissolve at will. This wire clamp has an advantage over the forceps clamp in that it does not crush the liver substance, the wires can be bent to conform to any sort of case, and the wire clamp cannot slip from the liver substance as the loops passing through the liver hold it firmly in place.

ACUTE PANCREATITIS, WITH EXTENSIVE FAT NECROSIS.

LUCIUS W. HOTCHKISS, of New York, read a paper with the above title, for which see page 111.

JOSEPH RANSOHOFF, of Cincinnati, had had several cases of acute pancreatitis in his own practice and had seen several

others in consultation, but in no one of these had the diagnosis been made before operation. He cited an interesting case of acute pancreatitis following a simple operation for the removal of the semilunar cartilage of the knee in an apparently healthy young man of 18. The result was fatal.

MAURICE H. RICHARDSON, of Boston, said that he had never had any success in operating on cases of acute pancreatitis, that all his recoveries had occurred in cases which had been left to nature. He believes that operative interference in a suppurative condition involving the entire pancreas is almost certain to bring about a fatal result.

JOHN B. DEAVER, of Philadelphia, stated that internists frequently confused a condition of pancreatitis with effusion with that of pleuritic effusion, but in his opinion acute pancreatitis should always be considered when there was a history of sudden illness accompanied by acute epigastric tenderness and rigidity.

FRED B. LUND, of Boston, reported two cases of acute pancreatitis operated upon successfully.

CHARLES A. PORTER, of Boston, referred to two cases of acute pancreatitis. In one a diagnosis of acute intestinal obstruction had been made, but a condition of acute hemorrhagic pancreatitis found; in this case an incision was made along the pancreas, a large amount of the viscus sloughed, but the patient eventually recovered. Because of persistent right-sided pain, however, a second operation was performed, when a putty-like accumulation was removed from the head of the pancreas; the patient later developed diabetes; he has been under observation for about five years. In the other case the condition of acute pancreatitis developed four days after a forceps delivery under ether; when the abdomen was opened an acute fat necrosis was found, and the woman died two days later.

ROBERT G. LE CONTE, of Philadelphia, stated that there had been two cases of acute pancreatitis with fat necrosis followed by recovery after operation at the Pennsylvania Hospital.

HENRY B. DELATOUR, of Brooklyn, reported a case very similar to that of the author, in a patient of thirty-two whom he saw on the fifth day after onset of symptoms; there was a decided bulging just above and to the left of the umbilicus; a median incision was made, and there being evidence of fat necrosis, on examination the cavity was found to extend back

to the stomach. The anterior wound was lightly packed and a posterior left lumbar incision made, permitting the evacuation of about a quart of thin purulent material. This wound was packed with zinc oxide gauze and a rubber drainage tube inserted. On the fifth day following operation there was a discharge of the contents of the stomach through the drainage tube, anterior drainage having been removed at the end of the fourth day. The patient recovered.

GEORGE WOOLSEY, of New York City, considered the essential feature in the treatment of these cases to be the drainage, saying that he never touches the pancreas and has had no trouble in any of his cases in obtaining a good result. He simply institutes drainage.

FREDERIC KAMMERER, of New York City, reported two cases of acute pancreatitis occurring in his practice during the last few months.

ROBERT B. GREENOUGH, of Boston, referred to two cases of mild pancreatitis occurring in his practice during the past winter, which recovered without operative interference. In both there were symptoms of intestinal obstruction high up. In one, Dr. Pratt made examinations of the urine and found acetone and diacetic acid, and also diastase, and he considered this satisfactory evidence of a condition of pancreatitis.

EMMET RIXFORD, of San Francisco, mentioned a case of pancreatitis in which the fat necrosis surrounded the mesenteric vein, causing complete obstruction of the same, the patient dying of congestion.

SAMUEL J. MIXTER, of Boston, cited a case showing how quickly fat necrosis may develop after the opening of the abdominal cavity when no evidence is discernible of this condition at the time of operation. In his experience the cases which recovered had usually been those in which the least amount of surgery was done, and he advocated the simple drainage by gauze.

N. B. CARSON, of St. Louis, mentioned the difficulty before operation of differentiating some cases of cholecystitis from those of acute pancreatitis, and referred to a case previously reported by him, in which a diagnosis of gall-stones was made but which on exploration proved to be a condition of pancreatitis; drainage was instituted and the patient made a good recovery.

HOWARD LILIENTHAL, of New York, referred to six cases of

acute pancreatitis operated upon by him with five recoveries. He thought that it was important to take into consideration the grade of the infection and the bacteriology of it, as well as the extent of the enlargement of the pancreas.

EDWARD MARTIN, of Philadelphia, spoke of five cases of acute pancreatitis, in each of which the diagnosis was made by the medical attendant; three of these cases occurred in the practice of the late Dr. John H. Musser.

ARPAD G. GERSTER, of New York City, considered drainage the only salvation in cases of acute pancreatitis, and particularly recommended posterior drainage as being more in conformity with the law of gravity than is anterior drainage. He referred to several successful results from this method.

LUCIUS W. HOTCHKISS, of New York City, considered drainage by both the anterior and the posterior routes to be more effective than either one used alone.

TALMA OPERATION FOR CIRRHOSIS OF THE LIVER.

EDGAR A. VANDER VEER, of Albany, read a paper with this title.

OBSERVATIONS ON TUBERCULOSIS OF THE BLADDER, URETER AND KIDNEY.

ARCHIBALD MACLAREN, of St. Paul, read this paper, for which see page 134.

SURGICAL DISEASES OF THE ABDOMEN AND UTERUS COMPLICATING PREGNANCY.

MAURICE H. RICHARDSON, of Boston, Mass., read a paper with the above title, which will be published in full in a later issue of the ANNALS OF SURGERY.

HEMORRHAGE INTO THE PERITONEAL CAVITY CAUSED BY ACCIDENTAL RUPTURE OF THE OVARY.

ALEXANDER PRIMROSE, of Toronto, Canada, read a paper with the above title, for which see page 125.

JOSEPH C. BLOODGOOD, of Baltimore, said that some years ago he reported two cases of clinically acute appendicitis, in one of which was found free blood in the peritoneal cavity

coming from the right ovary; hemorrhage was not excessive, nothing was done to the appendix, and the patient recovered. In the second case the hemorrhage was found coming from the fimbriated end of the Fallopian tube, the operation taking place during menstruation. In neither case was there any clinical suggestion of hemorrhage. Following this experience the speaker stated that he went over the histories of a number of cases and found that in the case of men he had never seen, or never recorded, hemorrhage in the peritoneal exudate. Up to the present time he had records of six cases of early appendicitis in women, some during the menstrual period, some in the interval, with considerable hemorrhage in the peritoneal cavity, but never to the degree reported by Dr. Primrose. In many cases the hemorrhage was but slight and there was no indication for the removal of ovary or tube.

HOWARD LILIENTHAL, of New York City, reported the case of a woman of 32, married two months, who had menstruated for the last time six weeks before he saw her, and then after an indiscretion in diet she vomited and became very faint. In a few hours another attack of faintness came on, followed by others at short intervals; she had all the symptoms of hemorrhage. Incision revealed a fibroid as large as a cocoanut attached to a pregnant uterus, and the peritoneal cavity full of blood. The fibroid was removed and the uterus sutured; the site from which the hemorrhage came could not be discovered. The patient made a good recovery, and there had been no miscarriage at the time of this report, three weeks after operation.

ARCHIBALD MACLAREN, of St. Paul, took exception to the usual idea that a certain time must elapse before a diagnosis of pregnancy can be made, believing that with fair probability it could be easily diagnosed at the first missed menstrual period. He thoroughly agreed with Dr. Richardson in his position regarding operations during pregnancy, and reported several instances where operative interference being necessary because of ovarian tumors, fibroid growths, and the freeing of a ventral fixation, it resulted in no interruption to the course of pregnancy.

LEWIS S. MCMURTRY, of Louisville, suggested that there was a possibility, in the cases reported, of the condition being the result of a tubal abortion.

THOMAS W. HUNTINGTON, of San Francisco, considered it

a wise precaution to remove at an early date in pregnancy what he termed an "occult" appendix, that is, one causing few symptoms but which every now and then gave sufficient evidence of its existence to warrant removal, considering that adhesions might result from such an appendix which might later be a source of serious difficulty.

ELLSWORTH ELIOT, JR., of New York City, cited a case of a young woman 18 years of age, supposed to be suffering from an attack of acute appendicitis, in whom operation revealed no disease of the appendix but the peritoneum filled with blood, there being found a laceration of the right Fallopian tube near its fimbriated extremity. This extremity was amputated and microscopical examination gave no evidence of a tubal pregnancy.

LEONARD FREEMAN, of Denver, referred to a case in the practice of one of his brother physicians, in which an athletic young lady in vaulting a fence experienced violent pain and collapse. Exploration demonstrated a Fallopian tube torn near its centre; ovaries, other tube, and uterus normal in every way with no sign of pregnancy.

JOHN B. DEAVER, of Philadelphia, stated that he considered acute appendicitis more important in the female than in the male, and that he believed salpingitis often resulted from the condition of the appendix. In his experience he had seen more cases of tubal abortion than of tubal rupture. In acute appendicitis during pregnancy, he advocated immediate removal of the appendix.

RICHARD H. HARTE, of Philadelphia, related the history of a patient, a woman long past the menopause, who was driving when she suddenly experienced violent pain on the right side; operation disclosed a large ovary, about twice the normal size, ruptured directly across, and the pelvis filled with blood. The ovary was removed, and after much examination microscopically a report was finally sent in of angiosarcoma. This case occurred over a year ago, and up to the present time there has been no recurrence of the condition in the pelvic organs.

ROBERT G. LE CONTE, of Philadelphia, detailed a case practically similar to that reported by Dr. Primrose, occurring in his practice a short time previously. The patient was admitted to the hospital with all the symptoms of ruptured ectopic pregnancy; at operation a quart of clotted and fluid blood was removed; the

right ovary was ruptured and had the appearance as if a Graafian follicle had existed filled with blood and been torn across, the vessels still bleeding; ovary was removed and tube left. The pathological report had not yet been received, but it more closely resembled a laceration of the ovary than an extra-uterine pregnancy.

A. VANDER VEER, of Albany, reported a case in which a diagnosis of intraperitoneal hemorrhage was made but operation not performed. The patient recovered slowly but completely, having an icebag applied and being kept in a condition of complete rest. He also referred, in connection with Dr. Richardson's paper, to a paper of his own on the subject of pregnancy complicated with inoperable cancer of the cervix, and said that it was his custom under such circumstances to advocate the emptying of the uterus.

CHARLES A. PORTER, of Boston, related the history of a woman of 30, married and pregnant two months, who had pain, tenderness, and fever, then increasing constipation, and tenderness in the left iliac fossa. Visible peristalsis. Operation showed an almost complete obstruction of the cæcum and a large intramesenteric abscess, probably a diverticulitis. Abscess was drained and a lateral anastomosis was done without excision. Patient has made a good recovery, and so far, two months since operation, there has been no interference with the pregnancy.

MAURICE H. RICHARDSON, of Boston, stated that he had frequently seen a ruptured Graafian follicle and had removed more than one ovary, considering it to be the cause of an intraperitoneal hemorrhage, which he now believed might have been simply an excessive hemorrhage during menstruation without any pathological significance whatever.

ACUTE DIVERTICULITIS OF THE SIGMOID FLEXURE OF THE COLON.

CHARLES A. POWERS, of Denver, Col., read a paper with this title, for which see page 118.

CANCER OF THE RECTUM AND RECTOSIGMOID.

WILLIAM J. MAYO, of Rochester, Minn., read a paper with this title, for which see page 240.

THE TREATMENT OF FISTULA IN ANO.

ARTHUR W. ELTING, of Albany, read a paper with this title.

JOHN H. GIBBON, of Philadelphia, agreed with Dr. Mayo that a two-stage operation was the one to be preferred in cases of carcinoma of the rectum with the growth situated high. By doing a preliminary colostomy he had in two instances been able through his abdominal wound to diagnose metastasis in the liver, which occurs very early in young people, and which contra-indicates the performance of a radical operation. It is now his custom to perform a preliminary colostomy and then a few days later to remove the growth. In regard to Dr. Elting's paper he stated that he had derived great satisfaction recently from injecting the fistulous tracts of fistulæ in ano with methylene blue, which greatly facilitates their dissection.

FREDERIC KAMMERER, of New York City, with reference to cancer of the rectum and rectosigmoid, stated that he considered it of the greatest advantage to allow the bowel to drain for two weeks, and to irrigate the lower intestine not only to diminish the sepsis, but also to gain another point, which was that frequently after such drainage made possible by the establishment of a preliminary anus, the growths in the rectum not infrequently became smaller and different in appearance, and the later operation became much more simple. He adheres to the establishment of a preliminary anus and the resection according to Kraske, after an experience with this method of about 70 cases.

W. L. ESTES, of South Bethlehem, Pa., called attention to the fact that one was apt in dealing with rectal cancer to lose sight of the type of carcinoma with which one had to deal, and stated in this connection that it was now generally conceded that the adenocarcinoma, as compared with other forms, has little tendency to recurrence. In his experience of 50 cases he had operated upon several supposedly hopeless cases in which the patients made most satisfactory recoveries. He agreed with Dr. Kammerer in that preliminary colostomy was frequently followed by a change in the appearance of the tumor, much of the size of which is due to inflammation, and in substantiation of this reported a case. He strongly advised that before attempting a radical operation in these cases a portion of the growth be excised

and examined in order to ascertain the true malignancy of the type of tumor present.

NATHAN JACOBSON, of Syracuse, N. Y., reported a case of diverticulitis simulating in its symptoms left-sided appendicitis. He stated also that in his experience the Kraske operation for cancer of the rectum and rectosigmoid had proved most successful, and he had not yet come to the point of establishing a permanent colostomy opening with complete excision of the rectum.

LEWIS L. MCARTHUR, of Chicago, reported a case of diverticulitis with unusual features. The patient had 16 years previously been operated on by another surgeon for a strangulated femoral hernia, and at the time the speaker operated a cord of omentum was found included in the femoral ring, and below this the lower portion of the sigmoid was so constricted that there was back pressure into the colon, making a condition recognized as a diverticular projection. There were over 200 diverticuli sticking out all over the sigmoid and descending colon. This patient recovered. With reference to Dr. Mayo's paper, he stated that in 1887 he recommended in cases of carcinoma of the rectum low down, in the female past the menopause, a resection of the posterior wall of the vagina for approach to the growth, then total excision of the lower part of the rectum, and suture between the upper angle of the vaginal wall and the rectal wall above, using the vaginal tract for an artificial anus. He at that time presented a patient so operated upon, in good condition three years later.

HOWARD LILIENTHAL, of New York City, said that in operating upon fistulæ in ano he would hesitate to follow the radical method advocated by Dr. Elting, fearing that a stricture difficult to overcome might result, or a serious infection take place endangering the patient's life.

EMMET RIXFORD, of San Francisco, added two cases of acute diverticulitis to those referred to in Dr. Powers's paper, in one of which, preparatory to operation, a dose of castor oil was administered; this evidently caused the tearing away of some adhesions, acute peritonitis set in, and the patient died.

FRED B. LUND, of Boston, briefly reported two cases of diverticulitis. In regard to cancer of the rectum he considered the Kraske operation very satisfactory in obese males, and stated

that wherever possible the abdomen should be opened and a permanent artificial anus established. In thin females in good condition and with a non-obstructing carcinoma, he considered the abdominal operation, one-stage, to be safe.

FRANCIS B. HARRINGTON, of Boston, added another case of suppurative diverticulitis to those already mentioned. In this case four inches of sigmoid were resected with a very satisfactory result.

KENNETH A. J. MACKENZIE, of Portland, Oregon, objected to the resection of the mucosa in fistulæ in ano from the viewpoint that if done in the presence of an infection severe sepsis might result and primary union become impossible. The advantages of radical operation are to be found in tuberculous fistulæ, for here the dangers of the ordinary operations are very serious, because they open up the granulomatous material lining the tract and allow dissemination of the tubercle bacilli.

THE EVOLUTION OF NEW BONE AND ITS RELATION TO THE REPRODUCTION OF JOINTS AFTER ANKYLOSIS.

JOHN B. MURPHY, of Chicago, Ill., said that the accurate appreciation of the embryology of bone is essential to a fuller understanding of the pathological processes and the reproductive power of bone. Ossification occurs in long bones through the division of the cartilage cell and the disturbance of the cartilage cell membrane from what is called the ossific centre. The osteoblasts then spread through all of the cartilage of the shaft, or better, the cartilage cells become transformed or displaced by osteal cells from one epiphysis to the other. This is what is known as cartilage ossification. The second type of ossification which takes place in flat bones, and particularly the bones of the face, is an ossification in a white fibrous tissue. In the embryo we have the representation of the bones of the face first in a white fibrous connective tissue; ossification starts in the centre or margin of this and spreads through all of the tissue. Ossification of white fibrous tissue takes place pathologically in the continuation of the periosteum as represented in the white fibrous tissue of the capsule of joints, particularly of the hip-joint. Ossification in white fibrous tissue takes place in the white fibrous strands of the muscle in myositis ossificans. Ossification can take place and does take place in blood-clots that occur near a lacerated periosteum or near a fracture. This ossification is believed to be due

to osteoblasts that have been carried by the blood stream from the fracture or from the lacerated periosteum, as was advocated by Macewen. The degree of ossification is limited by the periosteum or may be limited by the covering of the end of a bone by any of the mesoblastic type of tissues. In other words, when a fracture occurs, if the ends of the bone be covered with a fascia and muscle or a quantity of fat, no effort is made by the osteoblasts of the medulla, the compact bony tissue, or the subperiosteal layer to reproduce bone across the gap. If, on the other hand, the gap between the ends of two bones is filled by a blood-clot and not by an organized connective tissue in fractures of the long bones, a large area, an inch, an inch and a half, or two inches, may be spanned by the osteogenetic elements in their efforts to reunite the bone. In fractures of the flat bones there is no such prodigious effort made to produce a union; they rarely span one-quarter or one-half inch in their effort at the re-establishment of union after fracture. This is noticeable in the mandible and in the trephining operations and fractures of the skull.

We can to advantage divide the osteogenetic elements of bone, or liken the osteogenetic elements of bone to that of a tree, the medulla representing the trunk and always carrying the greatest osteogenetic potency; the Haversian canals, canaliculi, and lacunæ representing the branches of the tree, always carrying osteoblasts on the walls of the Haversian vessels; and the leaves are represented by the subperiosteal osteogenetic layer, in which in youth there is an enormous osteogenetic potency, in middle age a mild degree, and in advanced age no osteogenetic power. The periosteum of the epiphysis has no subperiosteal osteogenetic potency or inductiveness. The fact that this has no bone producing power accounts for the absence of callus and osteomata on the side of joints following fractures of the epiphysis. It will therefore be seen in the regeneration of bone we must utilize either the osteoblasts of the medulla, the Haversian canals of the lacunæ, or the osteogenetic inductiveness of the subperiosteal zone. We can set it down as a fairly well-established fact that in bone transplantation and bone grafting and bone reunions the following principles must be complied with:

1. The periosteum fully detached from bone and (1) transplanted into a fatty or muscle-tissue bed in the same individual, if he be young, may produce a lasting bone deposit; (2) transplanted into another individual or animal of the same species and

under the same conditions, it rarely if ever produces a permanent bone deposit; (3) transplanted into another species it never produces a permanent bone deposit.

2. Periosteal strips elevated at one end from the bone and attached at the other, if turned out into muscle or fat, reproduce regularly bone on their under surface for a greater portion of their entire length.

3. Transplanted into other individuals or animals of same species and contacting at one end with exposed or freshened bone, it rarely produces permanent bone, even for a small extent at its basal attachment, and never produces bone for its full length.

4. Bone with its periosteum transplanted into muscle, fat, etc., in the same individual, and free from bony contact, practically always dies and is absorbed, except in the case of very young children or infants. Transplanted into another species it is always absorbed.

5. Bone transplanted without the periosteum into the muscle or cellular tissue always dies and is ultimately absorbed.

6. Bone with or without periosteum transplanted in the same individual and contacted with other living osteogenetic bone at one or both of the ends of the transplanted fragment always becomes united to the living fragments and acts as a scaffolding for the reproduction of new bone of the same size and shape as the transplanted fragment if asepsis is attained. This new bone increases to such size as is necessary to give the support required by nature in the extremity in which it has been placed. It will scaffold the production of new bone even into the joint when it is surrounded by capsule, and tuberosities are produced in about the regular location, as in the normal anatomic conformation.

7. The transplanted fragment, no matter how large or how small, is always ultimately absorbed. The rôle it plays is to give mechanical support to the capillaries and blood-vessels with their living osteogenetic cells, as they advance from the living bone at both ends of the transplanted fragment into the Haversian canals, canaliculi, and lacunæ of the transplant. New lamellæ are deposited around the new capillaries, and these lamellæ fit into and adjust themselves in the graft, so that the bony union is actually formed and mechanical support given long before the transplant is entirely absorbed and replaced by new bone. Ultimately, all of the transplant disappears as new lamellæ are formed by the osteoblasts, and the graft lamellæ are removed by the osteoblasts.

The practical application of bone transplantation is to the following conditions:

1. To correct deformities resulting from defects of development, as aplasic extremital bones—radius, ulna, humerus, tibia, fibula, and femur, and congenital saddle-nose, aplasis mandible, etc.

2. To reproduce union in ununited fractures.

3. To replace bone removed by destructive infections, osteomyelitis, tuberculosis, lues, etc.

4. To restore or supplant fragments dislodged or destroyed by fractures, as the head of the humerus, head of femur, shaft of tibia.

5. To replace bone removed for non-malignant neoplasms, cysts, myeloma, osteitis fibrosa, etc.

6. To replace bone removed for encapsulated malignant disease, as giant-cell and chondral sarcoma, etc.

Dr. Murphy submitted a series of cases in which bone transplantation has been resorted to to fulfil the requirements mentioned in all of these particular conditions. (For illustrations see J.A.M.A., vol. lviii, No. 15, pp. 1097, 1098, 1099, 1100.)

ACUTE INFLAMMATION OF LONG BONES.

ROBERT G. LE CONTE, of Philadelphia, read a paper with the above title, for which see page 150.

THE SURGERY OF LONG BONES.

JAMES E. MOORE, of Minneapolis, read a paper with the above title, for which see page 155.

THE TOMATO JOINT.

ROBERT W. JOHNSON, of Baltimore, read this paper, for which see page 147.

END RESULTS OF FRACTURES OF THE SHAFT OF THE FEMUR.

W. L. ESTES, of South Bethlehem, Pa., read this paper, for which see page 162.

OPERATIVE FIXATION IN INFECTED FRACTURES OF LONG BONES.

HOWARD LILIENTHAL, of New York City, read this paper, for which see page 185.

OPEN TREATMENT OF FRACTURES.

EDWARD MARTIN, of Philadelphia, read a paper with this title.

OPERATIVE TREATMENT OF FRACTURES.

JOHN B. WALKER, of New York City, reported a series of 21 cases of fractures of the femur, in which operation was performed only after the best efforts of conservative treatment had failed. In every case before operation general anæsthesia had been employed to assist the efforts in reduction, also suitable extension had been applied. Nevertheless, in every case there persisted over 2.5 cm. shortening. Axial rotation was present in all such cases, together with angulation.

In operating the writer tries to scrupulously carry out every minute detail of Lane's technic, for there is no province of surgery in which results depend more upon the mechanical skill and cleanliness of the operator. Under no circumstances whatever do the fingers ever enter the wound. After the strong plate has been most satisfactorily applied by snug screws to the shaft of the femur it would seem as if no motion were possible. If, however, moderate strain be applied to the leg, some motion at the fractures can be appreciated. If this be continued the screws will become loosened and the fragments disarranged. For this reason no strain must be permitted. The plate must be considered only of value merely to approximate the fragments and not at all sufficient to hold them. For this purpose the whole reliance must be placed upon the solid external plaster cast, most accurately and carefully applied. If this does not succeed in absolutely immobilizing the fragments, the operation may fail.

There has been no mortality. In only one case was the plate removed and that was in one of the earlier cases when the operator was somewhat apprehensive, but when he cut down to the plate the screws were solid and it would have been unnecessary. Operations performed under the above indicated methods have been followed by excellent results. If this is possible in the cases of old, long-standing difficult fractures of the femur, how much more easily and more quickly can it be done in recent cases, and with how much greater safety and surety of securing an earlier and better functional result. It now appears that sufficient evidence has been shown to definitely recommend operations for fractures of the femur in such cases as where reduction is inadequate. Adequate reduction requires that the ends remain in apposition with-

out obvious angulation or axial rotation, and that the shortening be not greater than one-half inch. Further efforts to secure reduction by extension should not be continued after seven days, as it has been frequently demonstrated that where over-riding could not be pulled down in that time, no benefit could be gained by longer traction. Results warrant the belief that operations are indicated upon the femur in fractures of the upper and lower thirds, when the fragments are much displaced (as they frequently are) and in spiral fractures of the shaft; upon the humerus, in fractures of the surgical neck with dislocation or rotation of the head of that bone; and in fractures just above the elbow-joint; upon the radius and ulna when both bones are fractured; upon the radius when fractured at the junction of the upper and the middle thirds; and at the elbow- and ankle-joints, whenever the fragments cannot be replaced satisfactorily. Failures or disasters attending the open treatment of fractures are not due to the broad principle underlying the undertaking, but rather to inexpertness on the part of the operator or to faulty technic.

In fractures, the rapidity of union is proportional to the accuracy of reduction and the retention of fragments; delayed union is very largely due to faulty adjustment. Plating the fragments does not increase the nutrition but it brings the fragments into early intimate contact. "As our experience grows, we will be able to select, after a study of the X-ray plates, those cases in which operation is indicated."

CHARLES L. SCUDDER, of Boston, called attention to the fact that in this country, at least, the operative treatment of fractures was being carried out very thoroughly in order to reach a conclusion with regard to its merits, but he did not think the non-operative treatment received its share of attention in our medical schools and among the profession, and that it was therefore unfair to compare the results of the two methods. He believed that the ideal toward which all should strive would be that point where a surgeon on seeing a fracture could definitely make up his mind as to which method, the operative or the non-operative, would give the best results, and to proceed accordingly. He approves of the operative treatment in carefully selected cases, but believes many results obtained by it might also be obtained by the ideally carried out non-operative treatment in the ordinary cases.

JOSEPH RANSOHOFF, of Cincinnati, emphasized the fact that about 70 per cent. of fractures are not treated by surgeons,

but by the country practitioner, etc., and that it should be an aim of the Association to put means in such practitioners' hands to facilitate the reduction of fractures. For this purpose he proposed the use of a pair of common ice-tongs, which could be bought in any hardware store for a dollar and a half. These tongs can be driven into the lower end of a fractured femur without the use of an anæsthetic, and extension up to 40 pounds can be put on, which will usually prove sufficient for reduction. He had overcome the possibility of stiffness of the knee-joint resulting, by applying these tongs with the limb on a double-inclined plane.

JOHN B. ROBERTS, of Philadelphia, did not agree with Dr. Murphy in regard to the drainage of joints, that a man who put in a drainage and had a resulting ankylosis was to blame for that ankylosis since ankylosis had developed in cases where there had been no drainage. With regard to fractures he saw no reason for so much stress being laid on shortening, considering the great assymetry existing in many uninjured legs. He believed the simplest and least complicated apparatus for reduction was the best. He reported two cases ending fatally after the operative treatment for fracture of the femur, and stated that well-tried non-operative means in the great majority of cases would prove efficient, although admitting that under special circumstances the operative treatment may become necessary.

THOMAS W. HUNTINGTON, of San Francisco, believed as a rule, in the hands of competent and skilled surgeons, the operative treatment of fractures was safe. With regard to the introduction of foreign bodies in the treatment of compound fractures, he called attention to the fact that before treatment could be instituted in many cases there was an infection of the medullary cavity, and the introduction of such foreign bodies provided an inviting field for the extension of such infection along the medullary cavity with a resulting osteomyelitis and possibly either loss of a limb or the patient's life. He believed in pursuing the policy of allowing compound fractures to take their own course with as little interference as possible after apposition of fragments is obtained, until after the wound is healed and danger of osteomyelitis is passed. He reported one very successful case in which a portion of the fibula was transplanted into a defective tibia.

MAURICE H. RICHARDSON, of Boston, laid stress upon a statement made by Dr. Estes to the effect that the operative treat-

ment of fractures should *only* be performed by skilled men under the most favorable circumstances, and stated that he believed this to be the consensus of opinion throughout the Association.

OTTO KILIANI, of New York City, said that it should be impressed not only upon the profession but also upon the laity that excellent functional results could be obtained without an anatomically perfect alignment of bony structure. He would be extremely interested to hear the history of the patients whose fractures had been plated say ten years after operation, to see how many of these foreign bodies still remained in place.

FRED. B. LUND, of Boston, stated that in employing the operative method on old fracture cases there was the difficulty to be overcome presented by callus and adhesions, and that the majority of bad results were in such cases. He believed that in carefully selected cases this operative method was applicable to early fractures, particularly those of the long bones, transverse fractures of the femur, certain oblique fractures of the tibia with much overlapping, fractures of the humerus where the ends do not come together, and fractures of both bones of the forearm, and referred to several extremely good results obtained. He considered that a patient was more comfortable when put in a plaster-of-Paris spica dressing than with a Buck's extension with which the adhesive plaster is so apt to slip. In reference to Dr. Moore's paper in which was mentioned the use of bone wax in the bone cavities resulting after the curetting of osteomyelitis, Dr. Lund said that he had obtained most excellent results from lining the cavity with a skin graft.

A. T. BRISTOW, of Brooklyn, reported nine cases of fractures of the shaft of the femur operated upon during the last 18 months; each case healed by first intention and obtained an excellent result, and the patients ranged in age from 11 to 60 years. In every instance every conservative means known to the operator was tried before resorting to the more radical procedure, but where it was impossible by the older methods to get reduction, on cutting down on the fragments it was found that there was muscular or fascial tissue interposed between the ends of the fragments.

GEORGE E. ARMSTRONG, of Montreal, Canada, suggested a device which should always be tried in compound fractures in order to lock the fragments, and that was to notch the ends so that they would dovetail into each other; he had obtained

excellent results by this procedure. He felt the importance of impressing upon students the absolute asepsis which must be obtained in the treatment of fractures by the open method even beyond that necessary in abdominal operations, and that this operative method should not be attempted if it was possible to lock the fragments without it.

LEONARD FREEMAN, of Denver, called attention to many points of advantage, in his estimation, in the use of the external bone clamps to the internal bone plate.

CHARLES L. GIBSON, of New York City, said that he considered it was perfectly proper for Mr. Lane, with his marvellous technic, to operate on fractures, but that only one man in a thousand was so qualified, and therefore he endorsed the opinion that such work should be undertaken only by skilled surgeons.

G. G. DAVIS, of Philadelphia, said that not enough attention was paid to the methods of lateral traction or abduction in the reduction of fractures of the femur, and too much attention was given to Buck's extension, he having arrived at this opinion after seeing a large number of cases of ununited fractures in which the latter method had been employed.

RICHARD H. HARTE, of Philadelphia, gave as his opinion that many of the poor results obtained in simple fractures treated by the conservative methods to-day were due to the fact that the setting and reduction of these fractures in the large hospitals are as a rule relegated to the hospital interne, whose experience is not sufficient to warrant such responsibility being placed upon him. The attention of the chief, all too frequently, is only directed to fracture cases when they begin to do badly. He deplored the scant attention given at the present day in the medical schools to the teaching, both didactic and clinical, of this most important subject.

FRANCIS J. SHEPHERD, of Montreal, in speaking of the merits of the X-ray, also mentioned the fact that the laity at present considered it necessary to obtain, as had been said, almost a cabinet-maker's apposition of fragments, and that since the use of the X-ray it had been shown that this seldom was obtained. He considered it important to educate everybody to understand that it was the functional result and not the anatomical result toward which attention should be directed.

JOHN H. GIBBON, of Philadelphia, stated that he did not consider anæsthesia in the reduction of bad cases as helpful as did many others, and emphasized the fact that one cannot jerk

a fracture into place in five minutes, but that in many cases where the traction is allowed to extend over several days and there is a long and steady pull, the reduction may be easily accomplished; this applied particularly to fractures of the upper third of the femur and the surgical neck of the humerus. He also suggested that in fractures of the surgical neck of the humerus treated by abduction and Buck's extension, with the arm at right angles to the chest and the patient in bed, reduction could be safely accomplished.

LEWIS L. MCARTHUR, of Chicago, suggested the advisability in bad cases of reducing the fracture, if possible, then taking an X-ray picture and telling the patient that such was the best result to be obtained by mechanical methods, and allowing the patient the privilege of deciding, in case the position was not satisfactory, whether or not he desired operative interference, always explaining to him, however, that a functional result could be obtained without a perfect anatomical result.

ALBERT VANDER VEER, of Albany, cited instances in which X-ray pictures had not been at all encouraging as to the end results to be hoped for, but in which the patients ultimately obtained most satisfactory functional results.

WILLY MEYER, of New York City, reported an instance in which entirely too much reliance was placed on the findings by X-ray, the patient being repeatedly subjected to attempts at reduction, until finally, on falling into the speaker's hands, reduction and immobilization resulted in a good functional result, where the first surgeon had decided that only operative interference would be of avail.

THORKILD ROVSING, of Copenhagen, in discussing the reduction and treatment of fractures, referred to the successful results he had obtained from the use of Lambotte's method; he especially advocated its employment in compound fractures. With regard to aseptic ankylosis in joints he had met with considerable success in preventing it by the use of the injection of sterilized vaseline into the joint.

JOHN B. MURPHY, of Chicago, in discussing Dr. Le Conte's paper on acute osteomyelitis, said he considered it one of the most important subjects before the profession to-day, being in reality a condition like a gangrenous appendix in the end of the bone. He emphasized the necessity for early and radical operation, stating that a delay of 48 hours was not only extremely serious

but often fatal. In these cases he suggested the advisability of utilizing the method of bone transplantation after resection of the diseased portion.

TREATMENT OF THE DEFECT OCCASIONED BY PARTIAL EXCISION OF THE INFERIOR MAXILLA.

STANLEY STILLMAN, of San Francisco, read this paper, for which see page 70.

THE CONSERVATIVE TREATMENT OF GIANT-CELL SARCOMA.

JOSEPH C. BLOODGOOD, of Baltimore, read this paper, for which see page 210.

WILLIAM B. COLEY, of New York City, disagreed with Dr. Bloodgood in the statement that giant-cell sarcoma never produced metastasis, and gave a detailed history of a case proving this point, and from this experience concluded that there were certain cases of giant-cell sarcoma in which it was not safe to use conservative treatment and in which even the most radical treatment, amputation of the proximal joint, offered little or no chance of a cure. He briefly referred to 20 cases in which the clinical diagnosis of giant-cell sarcoma was confirmed by the microscope; 10 were of periosteal, 10 of central origin. In 15 of the 20 cases the mixed toxins of erysipelas and *Bacillus prodigiosus* were used before or after operation. In 10 cases amputation was performed. In nine cases either no operation or a conservative one (curetting) was done; in three of the nine cases the disease was too far advanced for the most radical operation, even a hip-joint amputation, and in one case, a subperiosteal sarcoma of the femur involving the lower third, metastasis had taken place. This patient is now well ten years after the toxin treatment was begun. In addition there had been two recent cases of sarcoma of the long bones in the hands of English surgeons in which the limb was saved by the use of the mixed toxins. He reported 21 cases out of a personal series of 107 cases of sarcoma of the long bones, in which the patient lived and remained well more than three years after operation; he believed the value of the mixed toxins in many of these cases to be quite beyond question.

EMMET RIXFORD, of San Francisco, referred to a case of giant-cell sarcoma of the lower end of the ulna treated by resection of the lower end of the bone, which had remained well without recurrence for 18 years.

JOHN B. MURPHY, of Chicago, said that in judging of the malignancy of a giant-cell sarcoma he relied more upon the X-ray picture than upon the microscopical examination; that the disease in malignant cases would be found to cross the epiphyseal line, while in the more benign form it did not do so. He approved more of resection than of curettement in these cases, following the resection of diseased bone by the transplantation of another piece of bone for the maintenance of support.

THE ETIOLOGY OF CONGENITAL DISLOCATION OF THE HIP.

EMMET RIXFORD, of San Francisco, read this paper. It will be published in a later issue of the ANNALS OF SURGERY.

CENTRAL DISLOCATION OF THE HIP.

GEORGE TULLY VAUGHAN, of Washington, read a paper with the above title.

PERMANENT INTUBATION OF THE THORACIC AORTA.

ALEXIS CARREL, of New York, reported the results of experimental intubation of the thoracic aorta in dogs, and illustrated his remarks by a series of lantern slides.

BULLET WOUND OF THE SPINAL CORD.

W. B. COLEY, of New York City, read this paper, for which see page 60.

EDWARD MARTIN, of Philadelphia, reported a case of fracture dislocation occurring between the sixth and seventh dorsal vertebræ giving all the evidences of complete transverse lesion, in which a laminectomy was performed, but with a fatal result.

FRANK E. BUNTS, of Cleveland, reported two cases of gunshot wound of the spinal cord. In one the bullet partially crushed the cord, the patient being totally paralyzed in the lower limbs. The bullet was removed and the patient has been making a slow but gradual improvement. The second case was a patient shot through the right lung, the bullet coming out back of the left scapula; patient totally paralyzed through the lower extremities; refused operation. Dr. Bunts considered that these two cases, one operated upon and one not operated upon, would give an excellent opportunity for showing the best method to pursue in these cases.

END RESULTS OF OPERATIONS FOR BRAIN TUMOR.

WILLIAM J. TAYLOR, of Philadelphia, read this paper, for which see page 55.

SURGERY OF THE ARTERIES.

ALBERT VANDER VEER, of Albany, read this paper, in which he recorded experiences antedating the antiseptic era.

THE TREATMENT OF SUBCLAVIAN ANEURISM.

ELLSWORTH ELIOT, JR., of New York City, read this paper, for which see page 83.

ALBERT E. HALSTEAD, of Chicago, stated that the patient operated upon by him for subclavian aneurism and referred to in Dr. Eliot's paper was still alive 20 years after operation. Dr. Halstead had had two more traumatic aneurisms of the subclavian, one an arteriovenous of the third portion from gunshot wound, which recovered after ligation of both the proximal and distal end of the artery. The second case was that of an Italian shot through the left shoulder; twelve days after the injury he developed an aneurism of the left subclavian. On attempting to perform a proximal ligation the operator accidentally opened the aneurismal sac and was therefore compelled to do both a proximal and a distal ligation; the left arm was amputated above the elbow within two weeks. It was the speaker's opinion that no man was justified in doing an arterioplasty on an aneurism excepting in certain cases of traumatic aneurism; in other instances distal and proximal ligation will be found efficient. Suture of the vessel only means temporary circulation, not permanent, and there is the risk of losing the patient from hemorrhage or embolus.

EMMET RIXFORD, of San Francisco, mentioned a method exploited many years ago by Dr. Cooper, of his city, which had in view the closing of an aneurismal sac from the outside by suture. He knew of no case in which the method had been tried, but considered it might be feasible in some instances.

HOWARD LILIENTHAL, of New York City, considered that in subclavian aneurism endoaneurismorrhaphy was impracticable. He considered that microbic aneurisms should be studied in a class by themselves, since they differ widely in requirements from the traumatic.

DIRECT GASTRODUODENOSCOPY IN AFFECTIONS OF THE STOMACH AND DUODENUM.

THORKILD ROVSING, of Copenhagen, Denmark, read a paper on the above subject, for which see page 201.

INTRATRACHEAL INSUFFLATION ANÆSTHESIA.

CHARLES H. PECK, of New York City, read this paper, for which see page 192.

DRAINAGE AFTER INTRATHORACIC OPERATION.

WILLY MEYER, of New York City, read this paper, for which see page 100.

GEORGE E. ARMSTRONG, of Montreal, Canada, said that in the Royal Victoria Hospital the intratracheal insufflation method of anæsthesia was daily gaining favor, it having now been used in about 50 cases. There had been no pulmonary complications, no sore throat, no hoarseness. Even in abdominal operations it had proved satisfactory and was considered to lessen the after-vomiting.

FRED B. LUND, of Boston, stated that this method of anæsthesia had made simple and easy operations formerly considered formidable; he had used it in thoracic operations, in excision of the tongue for carcinoma, excision of the pharyngeal wall for carcinoma, and for the removal of a papilloma of the vocal cord. He was most enthusiastically in favor of the method.

FRANK L. RICHARDSON, of Boston, presented an improved apparatus for the administration of ether by the insufflation method, claiming portability, simplicity, and efficiency for it.

CHARLES A. PORTER, of Boston, also spoke in favor of this type of anæsthesia and had found it most satisfactory; in some cases he considered it by far the safest method.

SAMUEL ROBINSON, of Boston, also presented a special instrument for the intratracheal insufflation of ether, being the instrument now used in the Massachusetts General Hospital. He claimed that it was extremely simple in action and that when once the tube was introduced it ran almost mechanically, requiring very little, if any, change in the ether supply until near the end of the operation. Its regulation is perfect, and it had proved most satisfactory.

ARPAD G. GERSTER, of New York City, said that the intratracheal insufflation method was a routine practice at Mt. Sinai Hospital, but that he had always considered the apparatus

of Elsberg as too cumbersome, and was glad to see simpler apparatus appearing. He thought there was need for still greater simplification and compactness, in order that the apparatus could be available in railroad accident practice, battles, etc.

ELLSWORTH ELIOT, JR., of New York City, said that at the Presbyterian Hospital the use of this method was increasing day by day and had proved most successful and entirely satisfactory. He reported a case which demonstrated, however, that post-operative pneumonia may occur even with this method.

DIAPHRAGMATIC HERNIA.

CHARLES L. SCUDDER, of Boston, Mass., reported a case of non-traumatic diaphragmatic hernia in an adult. The diagnosis of the existence of the hernia was made previous to operation. An operation for the repair of the hernia was undertaken in two stages: at the first operation the obstructed intestine was removed from the hernial orifice: three weeks later through an abdominal incision the contents of the hernia, including stomach, large omentum, and transverse colon, were reduced into the abdominal cavity and the hernial orifice sutured. The case is reported one year following the operative procedure. The patient is well and has resumed his regular work of laborer.

LEONARD FREEMAN, of Denver, presented two skiagraphs substantiating what the author has said regarding the value of the X-ray in making a diagnosis of diaphragmatic hernia. One picture was from a case in which hernia was not suspected, the condition being assumed to be due to pleural effusion, the result of a broken rib. The patient was operated upon, the abdomen opened, and a large opening found in the posterior portion of the diaphragm near the central line through which the fist could be inserted; the stomach had gone through this and an attempt to draw it back into the abdominal cavity was unsuccessful because of the suction. The stomach contents were then forced down and the stomach replaced in the abdominal cavity. The patient expired in a short time. It was the speaker's opinion that had the operation been performed through the chest rather than through an abdominal incision the patient would have stood a better chance of recovery.

NATHAN JACOBSON, of Syracuse, reported two cases of diaphragmatic hernia, one of traumatic origin, the other congenital, in which the diagnoses were made before operation and before the use of the X-ray.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, held at the Roosevelt Hospital, March 27, 1912.

The Vice President, DR. CHARLES N. DOWD, in the Chair.

ACUTE SUPPURATIVE OSTEOMYELITIS OF THE FEMUR.

DR. JAMES I. RUSSELL presented a boy, two years and four months old, who was admitted to the Roosevelt Hospital on July 15, 1910, suffering from pain, swelling and loss of function in the left knee joint. The child's past history was negative, and he had never been sick until his present illness, which began four weeks ago with pain and swelling on the inner side of the left thigh. Two days later he was quite ill with fever, prostration, etc., and was treated for two weeks at home and in another hospital, where tincture of iodine was applied.

On his admission to Roosevelt Hospital the child's temperature was 102.6°; pulse, 120; respirations, 20. A blood count showed 20,300 white blood cells, with 77 per cent. of polymorphonuclears. Examination showed a subperiosteal abscess of the left femur, which was drained by an incision on the inner and anterior aspect of the thigh. There was no apparent improvement following this, and an X-ray was taken, which showed extensive involvement of the femur. On July 30 a more extensive operation was done, which showed that the medullary cavity was infected throughout. On October 7, 1910, a third operation was performed to remove a sequestrum from the lower part of the femur, and subsequently several small sequestra were extruded. Since then the child had steadily gained in health. An X-ray, taken on March 19, 1912, showed a small sequestrum in the lower part of the femur. Otherwise, the bone was more normal in outline and contour.

CHRONIC OSTEOMYELITIS OF THE FEMUR.

DR. RUSSELL presented a boy, 8 years old, who was admitted to Dr. Brewer's service at the Roosevelt Hospital on March 1,

1912, complaining of pain in the right thigh, and inability to walk. The history obtained was that in July, 1911, eight months ago, he had typhoid fever, followed six weeks later by pain and swelling of the right thigh, for which he was operated on in another hospital for "disease of the femur"; a month later a second operation was done for a similar condition, and he remained in that hospital until one week before he was brought to Roosevelt Hospital.

Upon admission, his temperature was 99.2°; pulse, 100; respirations, 28. A blood count showed 16,000 white blood cells, with 69 per cent. of polymorphonuclears. An X-ray was taken, which showed extensive disease of the femur, with a sequestrum involving practically the lower half of the bone, which appeared as though it had been fractured. The child was in poor condition, pale and anæmic.

Two days after admission an incision was made along the outer side of the thigh from epiphysis to epiphysis. From the lower part of the incision, a rubber drainage tube was removed, and the involucrum, which was much thickened, was chiselled down to permit of the removal of a large sequestrum from the lower part of the wound, while several smaller sequestra were removed from the upper part. On the inner side, the lower one-third of the involucrum was deficient.

After thorough irrigation of the cavity, it was packed with a one per cent. formalin gauze. This was removed 72 hours later, and the cavity filled with Mosetig Morhoff wax and a few skin sutures introduced. The patient showed a moderate rise of temperature after the first operation, not exceeding 101.6°. After the introduction of the iodoform plug, the temperature did not exceed 101°, and reached normal five days later. Since then there had been considerable extrusion of the plug, mixed with pus. An X-ray, taken eleven days after the operation, showed that a good deal of the plug was still in place.

ACUTE OSTEOMYELITIS OF THE TIBIA.

Dr. Russell presented a boy, nine years old, who had already been shown at a meeting of the Society about eighteen months ago, and who was again presented at this time to illustrate the development of the bone since the operation three years ago, when a subperiosteal ostectomy was done. The X-ray pictures now suggested a new medullary cavity.

CHRONIC SUPPURATIVE OSTEOMYELITIS OF THE TIBIA.

DR. RUSSELL presented a girl, eighteen months old, who was admitted to the Roosevelt Hospital, in the service of Dr. Darrach, on July 18, 1911. The history obtained was that she had suffered from an abscess behind the ear, which was opened, the wound taking about six weeks to heal. Soon afterwards she developed an abscess on the right leg, which was opened and healed promptly, but about this time the left leg began to swell, and the child became quite ill, with fever, restlessness, etc., and developed an abscess over the left internal malleolus. This subsequently ruptured, and had been discharging up to the date of the child's admission into the hospital.

An X-ray was taken, which showed involvement of the entire tibia. On July 22, 1911, a subperiosteal resection was done. Convalescence was uneventful, the wound healing primarily, and the sutures were removed on the nineteenth day.

In connection with these four cases, Dr. Russell showed a number of lantern slides of the radiographic findings to illustrate the development of the bones after operation.

DR. GEORGE E. BREWER said that in the work of the staff at the Roosevelt Hospital, they were endeavoring, as far as possible, to have the men specialize along certain lines, and for the past two or three years Dr. Russell had been devoting special attention to the cases of osteomyelitis in every form. The four cases he had shown represented only a few of the large number he had operated on, and the results, as shown particularly by the X-ray findings, were very satisfactory. If, in these extensive cases of osteomyelitis, we were able to bring about a regeneration of the bone, the result must certainly be regarded as successful. Many of these cases represented a good deal of painstaking work, and Dr. Brewer said he felt assured that in some instances limbs had been saved which under the older methods of treatment would have been sacrificed.

TUBERCULOSIS OF THE TONGUE: CHRONIC PULMONARY TUBERCULOSIS: HEMIGLOSSECTOMY: INTRATRACHEAL ANÆSTHESIA.

DR. A. V. S. LAMBERT presented a man of 45 who had had chronic pulmonary tuberculosis for the past nine years. A month ago he first noticed a small nodule on the right side of the tongue, opposite a carious tooth. This nodule increased in size

rapidly until it involved almost the entire half of the tongue, the extreme tip and base not being involved. The lesion became ulcerated a week before admission, and since then had become exquisitely tender and very painful.

The patient was anæsthetized with gas and ether, and when he had become completely under the influence of the anæsthetics, the intra-tracheal tube was introduced and the remainder of the anæsthesia was completed by this means. A hemiglossectomy was done very readily, there being no difficulty with the inhalation of blood or secretion. The pharynx remained clear during the entire procedure.

On the day following the operation the patient's temperature rose to 102°; then promptly returned to normal. The expectoration was increased for the first day; it was slightly blood-tinged, and there was an increase in the number of tubercle bacilli it contained, as compared with the number before operation. The intra-tracheal anæsthesia irritated the chronic pulmonary inflammation but very slightly and kept the pharynx clear of blood and mucus.

GUN-SHOT WOUND OF THE THORAX: WOUND OF LUNG: HÆMO-PNEUMOTHORAX: POISONING BY BISMUTH.

Dr. Lambert presented a young man of 21 who received a shot-wound of the thorax. He was immediately brought to the hospital in a taxicab, and upon admission he was unconscious and in a state of profound shock. He was very pale, with a small, rapid, thready pulse. There was pronounced "air hunger," and the respirations were superficial, rapid and gasping in character. The wound of entrance was in the fifth intercostal space, at the right border of the sternum.

The patient was put to bed and given morphine for his restlessness, and hot salines per rectum. After an hour his condition had improved, and he showed signs of fluid in the right chest, posteriorly. This gradually increased in quantity, until the patient developed signs of dyspnœa. A thoracotomy was thereupon done, with partial ostectomy of the ninth rib, and a large amount of bloody fluid was evacuated. This had a pronounced odor, and contained streptococci. There was a positive blood culture of streptococci, and the patient became very ill and septic.

After he had improved sufficiently, his chest cavity, which was very large, was injected with a paste containing bismuth subnitrate, 10 per cent., and formalin, which controlled the growth of saprophytes. For the purpose of taking an X-ray photograph, his chest cavity was injected with eighteen ounces of a 33⅓ per cent. of bismuth carbonate. Most of this promptly oozed out, but on the third day the patient developed an acute parenchymatous nephritis, which lasted seven days, and was followed by salivation, gingivitis, glossitis and an acute diarrhœa. At the onset of the nephritis, his chest was cleared of the bismuth paste. At the present time, his gums, tongue, the mucous membrane of the cheeks and floor of the mouth and his pharynx were blackened by the deposition in them of metallic bismuth. He had now recovered from the acute symptoms, and was improving.

Dr. Robert T. Morris suggested the use of trypsin, or better, of acidulated pepsin solution, for the purpose of liquefying the coagula. In reply to a question as to whether the action of digestives could be limited, Dr. Morris said he had made some vivisection experiments with digestives which showed that the tendency was for their action to be limited to substances not penetrated by capillaries. He would liquefy part of the coagula; wash out the treacle-like residue, and repeat the process according to judgment in any given case. Coagula in the thorax or in the bladder could be liquefied rapidly.

PHLEGMONOUS INFLAMMATION OF THE LARGE INTESTINE.

Dr. Charles N. Dowd read a paper with the above title.

VILLOUS ARTHRITIS OF THE KNEE (SARCOMA).

Dr. Charles N. Dowd said this patient was presented to the Society to illustrate the very extensive formation of villi within the knee joint, and the good effects of operation. The specimen removed showed the great difficulty of accomplishing a cure by other methods and also illustrated the indefiniteness of the group of lesions which were included in the general term "sarcoma."

The patient was a vigorous man, 33 years old, who entered Roosevelt Hospital on August 29, 1911. For 4 years he had suffered from swelling and moderate disability in his knee, having remissions when he rested, and applied bandages and counter-irritants. During the last year he had suffered considerable pain,

and the swelling and disability had increased. He had never had locking of the joint. Physical examination showed a diffuse swelling of the right knee, which in circumference was 2½ cm. larger than the left. Patellar click present. Loose bodies felt on each side of the patella. Tenderness on pressure over both semilunar cartilages. Flexion limited to 95°. No atrophy. No muscles spasm on moderate motion.

On opening the joint, villi were found to an enormous extent, one mass was 2 inches in length and 1½ inches in breadth, it was composed of small nodules and looked like a flat bunch of grapes. Villi projected from many parts of the joint wall, but were most marked on the outer side. Some were hard and cartilaginous; others were soft and moderately vascular (Fig. 1). There was no caseation. There were about two ounces of clear, thick, straw-colored fluid in the joint. As many villi were excised as was practicable, and the joint was washed out with saline solution. The patient made a good recovery, and left the hospital in three weeks.

Last September he returned to his work, which was that of a barber. He stands many hours every day, has good motion in the knee joint, very slight swelling, and almost no pain. The size of these villi was excessive, and one could appreciate the difficulty of treating a joint by external application when there was so much disturbance from the presence of foreign bodies within it. Although we realize the good effects of some forms of treatment and of local and external applications in certain types of villous arthritis, it is very difficult to see how these methods would be efficient in a case in whom the villi had reached such enormous size.

With regard to the confusion which exists about sarcomata, we may cite this as another example of a patient who had a new growth which had giant and spindle cells and which on careful and expert examination was reported as sarcoma.

The examination was made by Dr. Mortimer Warren, who reported as follows:

Specimen.—There are many small bodies having papillomatous projections attached to main tissue by fibrous bands. The cut surface of each is smooth and contains small masses 3 to 5 mm. in diameter, separated from each other by fibrous capsules. They can be shelled out and appear cartilaginous.

Microscopic Examination.—Periphery consists of an infiltrated vas-

FIG. 1.

Villi removed from the interior of the knee-joint. Microscopical examination showed the specimen to be sarcoma. (Dr. Dowd's patient.)

FIG. 2.

Microscopical section of villous growth of knee-joint (× 200). Sarcoma. Shows giant-cells and detail of stroma.

cular fibrous tissue. The mass of tissue is made of closely packed cells, mostly spindle or oat-shaped. They are separated into large bundles by coarse strands, and into smaller ones by thin fibrils of connective tissue. Scattered about are giant cells (Fig. 2). Blood vessels are numerous and for the most part have good walls, but there are many smaller blood spaces enclosed simply by the tumor cells. Mitotic figures are present.

Diagnosis.—Giant-cell sarcoma.

Some pathologists question the propriety of applying the term sarcoma to many of these giant-celled growths, especially the epulides. On the other hand he had at the present time under observation a growth which was an epulis at first, which was reported as a fibro-sarcoma of apparently very mild virulence and which has proved to be of overwhelming malignancy.

Both clinical and microscopical studies are continually indicating the extreme variability in the group of growths which are called "sarcoma." A variability which is most confusing when we endeavor to estimate the value of various forms of treatment.

The recent studies of Lejars and Rubens-Duval (Revue de Chirurgie, No. 41, p. 751) indicate that local resection is not often advisable treatment for sarcoma of the synovia, but one who sees this patient and the appearance of the specimen would hardly think of a more radical form of treatment. A long period of careful observation was desirable.

CARDIOSPASM.

Dr. Charles N. Dowd showed a woman, 38 years old, otherwise healthy, who presented a typical picture of cardiospasm.

For about a year she had been suffering from frequent vomiting and from loss of strength and weight when she was admitted to Roosevelt Hospital, June 11, 1911. She had been under the usual forms of treatment and had consulted many doctors. She finally came to the hospital with a diagnosis of cancer of the œsophagus. Her condition at that time was truly pitiable, her weight had diminished from 163 to 119 pounds, and when she attempted to eat she would quickly regurgitate the food, so that she had learned to have a basin beside her when sitting at the table, thus providing for her regurgitations. On coming to the hospital, it was found that a stomach tube passed easily and she was benefited by this passage so that she could

swallow much better for a day or two, but after that time her symptoms returned and were as bad as ever. Gastric contents removed through the stomach tube were found to be normal. The material which was regurgitated did not contain hydrochloric acid, a proof that it came from the œsophagus, not from the stomach. X-ray examination showed a moderate dilatation of the entire œsophagus and constriction of the cardia (Fig. 3). Examination with an œsophagoscope made by Doctors Janeway and Green showed that the stricture yielded easily to pressure, nothing of a cancerous nature was found in it. The benign character of the stricture was further borne out by the fact that there had been no bleeding. She left the hospital temporarily, but on July 25 he dilated the cardia without an anæsthetic, using the Plummer apparatus, running the pressure up to 30 several times and then allowing it to diminish. Her condition on going back to the ward was really remarkable, she went to the dining room, took a glass of water and was surprised to find that she could swallow it perfectly. Her delight was dramatic. She had to repeat the experiment a second and a third time before she was really convinced that her difficulty in swallowing had ceased. The dilating was repeated about once a week until October 1. On November 1 she weighed 140 pounds, a gain of 21 pounds. She looked well and said she was as well and strong as ever. On January 17 she weighed 148 pounds and on March 1 154 pounds. She has recently had an occasional slight gagging when eating. A stomach tube passes, but the Plummer dilator does not pass the cardia. It probably will pass in due time. This peculiarity of sometimes permitting the instrument to pass, at other times not permitting it, is rather characteristic of the disease. In considering this case, it is interesting to note, that she went during a period of more than a year to a large number of physicians and several hospitals and that a diagnosis during that time had not been made. Attention has recently been called to the condition by several writers and no doubt the diagnosis will be quickly made in cases that now come to our notice.

COLLARGOL RADIOGRAPHS OF KIDNEY AND URETER.

Dr. Charles H. Peck showed a series of these cases, with lantern slide views of the X-ray findings.

Case I.—The patient was a woman, 52 years old, who gave a history of attacks of right lumbar pain for the past three years.

FIG. 3.

Radiogram taken after ingestion of bismuth paste, showing dilated œsophagus and closed cardia.

These attacks came on at intervals of about every four months, and were usually from twelve to twenty-four hours in duration. The urine during the attacks was sometimes clear; at other times of a reddish tinge, and on one occasion, about two years ago, contained a large amount of pus. No marked variation in the amount of urine passed had been noted. The patient's last attack, which was the most severe, was of two weeks' duration.

A cystoscopic examination was made, which showed no ureteral obstruction on either side, with good secretion from both ureters. The capacity of the right pelvis was 40 c.c., about double the normal. The radiograph for stone was negative, but the collargol radiograph showed a dilated pelvis, with its lower part hooded over the ureteral implantation, so as to cause valvular obstruction when distention occurred.

Operation, February 17, 1912: An incision was made into the dilated pelvis posteriorly, and a small calculus removed. The calices were dilated and the cortex thinned. A cicatricial stricture of the ureter, about half an inch below the pelvis, was carefully dilated up to 15 F. The cortex of the kidney was then opened, and a ureteral catheter with stylet was passed through the nephrotomy wound to the bladder and left there as a splint, and through the same wound a tube was put in to drain the pelvis. The wound in the pelvis was then sutured, and a cigarette drain introduced to the perirenal space.

The ureteral splint was removed on the third day, and the pelvic drain five days later. There was no urinary discharge through the wound after the tenth day. The patient was discharged on the fifteenth day with the wound completely healed.

Case II.—This was a girl, nine years old, who was admitted to the Roosevelt Hospital on October 28, 1911. For about a year prior to that time she had suffered from attacks of pain in the left kidney region. These occurred at frequent intervals, and three days before her admission she had had an unusually severe attack, accompanied by fever, nausea and vomiting. Her temperature on admission was a fraction below 103°, and on examination of the urine it was found to contain pus. She was kept under treatment in the medical division for two and a half months, and transferred to the surgical service on January 13, 1912, during a sharp exacerbation of symptoms.

Repeated examinations of the urine for tubercle bacilli gave negative results, but on two occasions the bacillus coli communis

was found. The leucocytes varied with the acuteness of the symptoms from normal to 37,000, and the percentage of polymorphonuclears to 92. The patient had periods of almost complete remission from symptoms for days at a time. The cystoscope showed purulent urine from the left kidney. A radiograph for stone was taken, with negative results. The collargol radiograph showed a dilatation of the ureter, with moderate dilatation of the kidney pelvis.

Operation, January 14, 1912: The kidney was found to be moderately swollen, and sparsely dotted with tiny, whitish spots beneath the cortex. Frozen sections from the cortex, including one of these spots, showed no evidences of tuberculosis. The pelvis was inflamed, and moderately dilated.

A nephrotomy was done and a ureteral probe was passed without difficulty to the bladder. A tube drain was secured in the pelvis. The urine drained freely for eight days, when the tube was removed. The patient was discharged 22 days after the operation, her wound having completely healed. The convalescence had been practically uneventtul.

Case III.—The patient was a man, 35 years old, who was operated on for ureteral obstruction and hæmaturia in June, 1907. Cystoscopy at that time showed obstruction of the left lower ureter. A nephrotomy was done and the ureter dilated from above with ureteral probes. No calculus was found.

The patient remained free from symptoms until the day before his admission to the Roosevelt Hospital, on December 19, 1911. A cystoscopic examination was made, which showed an impassable obstruction in the lower end of the left ureter. No urine could be seen coming from the left ureteral orifice.

Operation, December 23, 1911: The ureter was exposed in the iliac region extra-peritoneally and except for the lower 2 or 3 inches, was found to be much dilated. Upon opening it, no stone was found. There was a tight stricture at the intravesical portion, which was finally passed from above with a fine probe and dilated up to 18 F. The ureteral wound was closed by suture, and a cigarette drain introduced. The wound healed promptly, without leakage. On January 4, 1912, a ureteral catheter was easily introduced to the pelvis of the left kidney. A collargol radiograph of this case showed a greatly dilated ureter and pelvis.

CASE IV.—The patient was a man, 32 years old, with a history of intermittent pain in the left lumbar region for several years. The pain was of moderate severity, but disabling while present, the attacks recurring every week or ten days. Physical examination had always been negative. A cystoscopic examination, made in August, 1911, showed good function on both sides, with no ureteral obstruction. As no lesion was found, the patient was discharged. His attacks of pain continued as before, and in October, 1911, he was re-admitted for an exploratory operation. Laparotomy through left rectus showed no intra-peritoneal lesion, but revealed a tensely dilated left kidney. Incision over the kidney showed a hydronephrosis from a hooded pelvis with valvular obstruction of the upper ureter. A portion of the posterior wall of the pelvis was excised, and sutured in such a way as to correct the hooding and valvular obstruction. A ureteral catheter was passed into the bladder from above and left as a splint, and the pelvis of the kidney was drained. On the sixth day after the operation, after removing the drain, an attempt was made to withdraw the ureteral catheter, but this proved unsuccessful on account of some obstruction. On the following day it was withdrawn with considerable difficulty, and a knot was found to have been tied near its tip, evidently from curling up in the bladder.

This patient's convalescence was delayed by a post-operative pneumonia, and he left the hospital, well, on the twenty-third day after operation.

This case, Dr. Peck said, illustrated a condition which could have been easily recognized by a collargol radiograph, had the method been in use at that time.

CASE V.—The patient was a woman, 25 years old, who was admitted to the Roosevelt Hospital on December 11, 1911, with the history that about a month before, after an attack of coughing, she developed a pain in the right kidney region. This radiated downward, with tenderness in the same region, and two days ago it had grown more severe. Palpation showed only moderate tenderness on deep pressure.

The cystoscopic examination was negative. A collargol radiograph showed a sharp kink in the right ureter, about two inches below the pelvis.

Operation, December 15, 1911: The kidney was low in

position, but both kidney and pelvis were normal in appearance, as was the ureter, but upon drawing this out of the wound, careful examination showed a tense, vascular band crossing the ureter at the site of the kink, and over this the ureter evidently hung with the kidney in its prolapsed position. A nephrotomy was done and a ureteral splint inserted to the bladder, with a tube drain to the pelvis. A nephropexy was then performed.

The ureteral splint was removed on the fifth day, and the pelvic drain three days later. A collargol radiograph, taken on the nineteenth day, showed no kink in the ureter. The patient was discharged, well, on the twenty-third day.

Dr. Robert T. Morris said that in using collargol in connection with radiographic work about the kidney and ureter one should bear in mind the possibility of the presence of a calculus having the same index of refraction as collargol itself. The speaker said he had in mind a recent case where the collargol radiograph failed to show the presence of a stone, and yet at the operation a large one was found.

Dr. Peck thought the point brought up by Dr. Morris was very important. In their own work, the speaker said, they always took a radiograph before the collargol was injected, and then a collargol radiograph was taken. They had seen no harmful results follow the use of collargol—nothing more serious than slight pain.

Dr. Brewer said that a few days ago, while operating on a kidney that had been injected with collargol, he found that about four or five ounces of the solution had remained within the kidney. In the course of the operation, the pelvis was accidentally ruptured, and the collargol solution spilled all over the wound and probably helped to sterilize it.

Dr. A. V. Moschcowitz said he had seen one case of hydronephrosis where serious collapse followed an injection of collargol. The patient was in a condition of profound shock, which lasted for several hours, but finally recovered. In this case, Dr. Moschcowitz said, less than two ounces of a two per cent. solution were given, and he had an idea that the injurious after-effects were due to the mechanical rather than the chemical effects of the collargol.

Dr. William A. Downes said he had had one case where a five per cent. solution of collargol injected into both kidneys simultaneously produced intense pain with more or less tender-

ness, that lasted over night. The pain was over the normal kidney—not the one that was diseased. The speaker said he regarded the pain complained of after these injections as mechanical in origin.

Dr. Peck said they generally used a 10 per cent. solution, and thus far, in their rather small series of cases, they had seen no ill-effects follow the injections. They had never attempted to inject both sides at the same time, and the collargol was washed out as thoroughly as possible with some bland solution as soon as the radiograph was taken.

MUSCULOSPIRAL PARALYSIS: TRANSPLANTATION OF VEIN.

Dr. George E. Brewer presented a man, 22 years old, who in August, 1911, sustained a fracture of the middle third of the humerus, associated with complete paralysis over the distribution of the musculospiral nerve. Non-union followed conservative treatment, and subsequently the fragments were wired together by an open operation. As there was no improvement in the paralysis, a second operation was undertaken to unite the severed nerve, but this was unsuccessful on account of the inability to find the upper segment.

The patient was admitted to the Roosevelt Hospital two months ago, and again operated on with a view to nerve suture. An eight-inch incision was made over the course of the nerve from the axilla to a point just above the external condyle. The lower end of the nerve was readily found, with its bulbous extremity adherent to the abundant callus. About four inches above this the upper extremity of the nerve was found, with its bulbous end also leading into the callus.

After removal of the bulbed extremities, it was found that the two divided ends of the nerve were separated by an interval of about five inches. The right saphenous vein was exposed and dissected out, after ligating both its extremities, the contained blood remaining within its cavity. The divided ends of the nerve were then inserted into this vein and sutured into place; the external wound was closed, and a dressing applied. Primary union followed.

Up to the present time there had been no change in the paralytic symptoms.

Dr. Alfred S. Taylor said that Kilvington of Melbourne had

demonstrated experimentally that if one could transplant nerve substance between the ends of a divided nerve, the chances of regeneration would be better than by other means of bridging, and this applied to both sensory and motor nerves. For this purpose he suggested the use of the long saphenous nerve, cutting it up into segments and forming it into bundles of sufficient size. He thought this method offered a better chance for the regeneration of the nerve than the interposition of a blood clot, which was sure to organize.

Dr. Taylor said that in a case where he operated last August, there was an interim of four inches between the nerve ends which he tried to bridge by interposing the saphenous nerve. There were no evidences of regeneration in that case up to the present time, although it was still too early to expect it. He knew of no case where an interval of over two and a half inches in a severed nerve had been successfully bridged.

EPILEPSY: CRANIOTOMY AND DECOMPRESSION.

Dr. Brewer showed a twelve-year-old girl who entered the hospital eighteen months ago, suffering from focal epilepsy. She gave an indefinite history of having met with an injury to the head seven years before. Six months later, a slight spasm of the left eyelid, of short duration, was noticed. This was followed by a number of similar attacks, and later became associated with a jerking of the head to the left. She was put on bromides, and for one year was free from these attacks. Four years ago they recurred, and since that time they had become very frequent, ranging from five or six to twenty or thirty a day. For two years these had been uninfluenced by the bromides.

The attacks began by a spasm of the left eyelid, quickly followed by contractions of the left side of the face, the head turning to the left and the convulsive movements extending to the arm and leg. There had never been complete loss of consciousness. During the girl's stay in the hospital, the spasms averaged twenty a day.

Operation: Upon exposing the right motor area, nothing was found but evidences of increased intracranial tension, with marked hyperæmia of the pia, and a small, thickened area over the lower part of the motor tract. A decompression operation was then done in the temporal region, and the bone flap over

the motor area was replaced. On the day following the operation, she had six light convulsions; on the next day only one, and then they ceased entirely for several months. During the eighteen months which had elapsed since the operation, she had had 41 slight seizures. Her general health is good.

INTERSCAPULO-THORACIC AMPUTATION FOR RECURRENT SARCOMA.

Dr. Brewer presented a man, 28 years old, who two years ago suffered from a tumor of the left fifth finger. This was removed, with a subsequent recurrence in the stump, for which the hand was amputated near the wrist joint. There was a second recurrence in the stump of the forearm, followed by amputation in the lower third of the humerus.

When the patient came to the Roosevelt Hospital, there was an extensive recurrence in the stump and also in the axilla. Pathological examinations of the earlier specimens showed the growth to be a mixed-celled sarcoma, and this diagnosis was verified by the removal of a small nodule from the recurrent tumor in the stump.

An interscapulo-thoracic amputation was done by Dr. Brewer six weeks ago. The wound healed primarily, but since then there had developed a small nodule near the point of ligature of the axillary vessels. The patient was now being treated with the X-ray and Coley's mixed toxins.

Dr. Ellsworth Eliot, Jr., said that about eight years ago he showed a case similar to this one, in which, in addition to the axillary metastasis, the sarcoma had involved the point of the shoulder and the adjacent part of the clavicle and acromion process. The scapula as well as the clavicle were removed, but within a year the patient died of metastases in the vertebral column, which was the rule in these cases. There were very few cases on record where the patients had remained free from recurrence.

Dr. William B. Coley mentioned a case of his own, somewhat similar to that of Dr. Brewer's—a spindle-celled sarcoma starting in the metatarsal bursa, which was removed by Dr. Bull, in 1889, a Symes amputation being performed. About 1½ years later a recurrence took place in the soft parts of the popliteal space, which was again removed by Dr. Bull. On account of

a local recurrence shortly afterwards Dr. Coley amputated the thigh just below the trochanter and put the patient upon the mixed toxins which were kept up for a considerable time. A fourth recurrence finally took place in the fascia of the gluteal region; this was removed by operation and the toxins continued for nearly a year, with final cure, the patient remaining well at the time of last observation, ten years afterward.

In the case shown by Dr. Brewer, Dr. Coley thought that an earlier use of the toxins might have prevented some of the previous recurrences.

Dr. Coley, in reply to a question, stated that he had himself performed interscapulo-thoracic amputation in three instances, two adults and one child, all of whom had died within a comparatively short time after operation, two within six months and one within a year. Dr. Nancrede, in his presidential address delivered before the American Medical Association three years ago, collected all the cases in which interscapulo-thoracic amputation had been performed for sarcoma of the scapula, and found not a single case permanently cured.

Dr. Coley stated that one of his cases confirmed what Dr. Dowd had said in regard to the pathological reports not always being a good guide as to prognosis. This was a case of sarcoma of the upper third of the humerus following a fracture, in a boy of ten; the tumor was of extremely rapid growth. Dr. Coley did an interscapulo-thoracic amputation three weeks after the tumor was noticed. Dr. Ewing pronounced the growth a giant-celled sarcoma of mild malignancy and thought the operation was perhaps too radical. In spite of the early and radical operation as well as subsequent use of the mixed toxins, there was an extensive metastatic recurrence in the lung within a year, causing the death of the patient a few months later. Dr. Coley stated that he had a number of cases similar to this, which disproved the dictum of many writers, and particularly of Bloodgood, that a giant-celled sarcoma was never followed by metastases.

In regard to Dr. Brewer's case, Dr. Coley stated that not many years ago an amputation would have been advised in this case. He stated that for a number of years he had strongly advocated conservative treatment in cases of sarcoma of the long bones, *i.e.*, giving a course of toxin treatment, either as a pre-

liminary measure, or after a conservative operation, before resorting to amputation. He stated that within the last two weeks he had had an opportunity of re-examining four cases in which the limb had been saved by the use of the toxins alone or in conjunction with conservative treatment. One of these was a case of giant-celled sarcoma of the lower end of the radius, with spontaneous fracture, in which Dr. Hartley and Dr. Poole, after simple curetting, which established the diagnosis, had advised immediate amputation of the arm, which the patient refused. She was sent to Dr. Coley at the General Memorial Hospital and, under six weeks' treatment with the mixed toxins, without any further treatment whatever, the tumor entirely disappeared and the patient is now in perfect health, four years later.

The second case was referred to Dr. Coley by Dr. Irving S. Haynes, a year ago, for a rapidly growing sarcoma of the radius, giant-celled, with extensive infiltration of the soft parts. He decided to give the patient a brief trial with the toxins before amputation. Under ten weeks' treatment, the disease disappeared and the patient is at present perfectly well. Both of these cases have perfectly useful arms.

The third case was a sarcoma of the tibia with rapid recurrence after three conservative operations, in which the disease finally disappeared under the toxin treatment, in this case combined with a small number of X-ray treatments; the patient is now well seven years, with a perfectly useful limb.

The fourth case was a sarcoma of the femur of the small round-celled type, with extensive metastases in the pectoral, as well as ilio-lumbar region. The patient made a complete recovery under a few months' treatment with the toxins and is perfectly well at present, ten years later.

Dr. Coley stated that he had had about ten cases in all in which the limb had been saved by the preliminary use of the toxins. The cases could be found reported at length in his paper read before the French Congress of Surgery, October, 1911.

SARCOMA OF THE RADIUS: TRANSPLANTATION OF BONE.

Dr. Brewer presented a man, 24 years old, who was admitted to the Roosevelt Hospital suffering from a tumor involving the lower end of the radius. The X-ray showed a medullary

growth suggesting myeloma, or possibly chondroma. An incision was made over the flexor surface of the forearm, just external to the tendon of the flexor carpi radialis. A thin sheet of bone covering the projecting part of the tumor was removed, and the entire growth curetted from the bone cavity. Frozen sections showed the growth to be a mixed-celled sarcoma, and the lower three inches of the radius were thereupon removed, together with the periosteum.

A week later the wound was re-opened and three inches of a radius previously removed from an individual who had died as the result of a gun-shot wound of the abdomen was introduced, the soft parts were sutured, and the wound closed without drainage. The wound healed by primary union under the first dressing.

Dr. Brewer said this operation was undertaken in the hope that the implanted bone would result in preserving the normal relation of the parts, and that during its absorption new bone would gradually take its place, being developed from the cortex and endosteum of the healthy fragments.

Dr. Brewer, in reply to a question as to why he did not leave the periosteum, said that that had occurred to him, but he decided against it because the shell of bone in the diseased area was exceedingly thin, and he feared that the periosteum had already become infected.

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